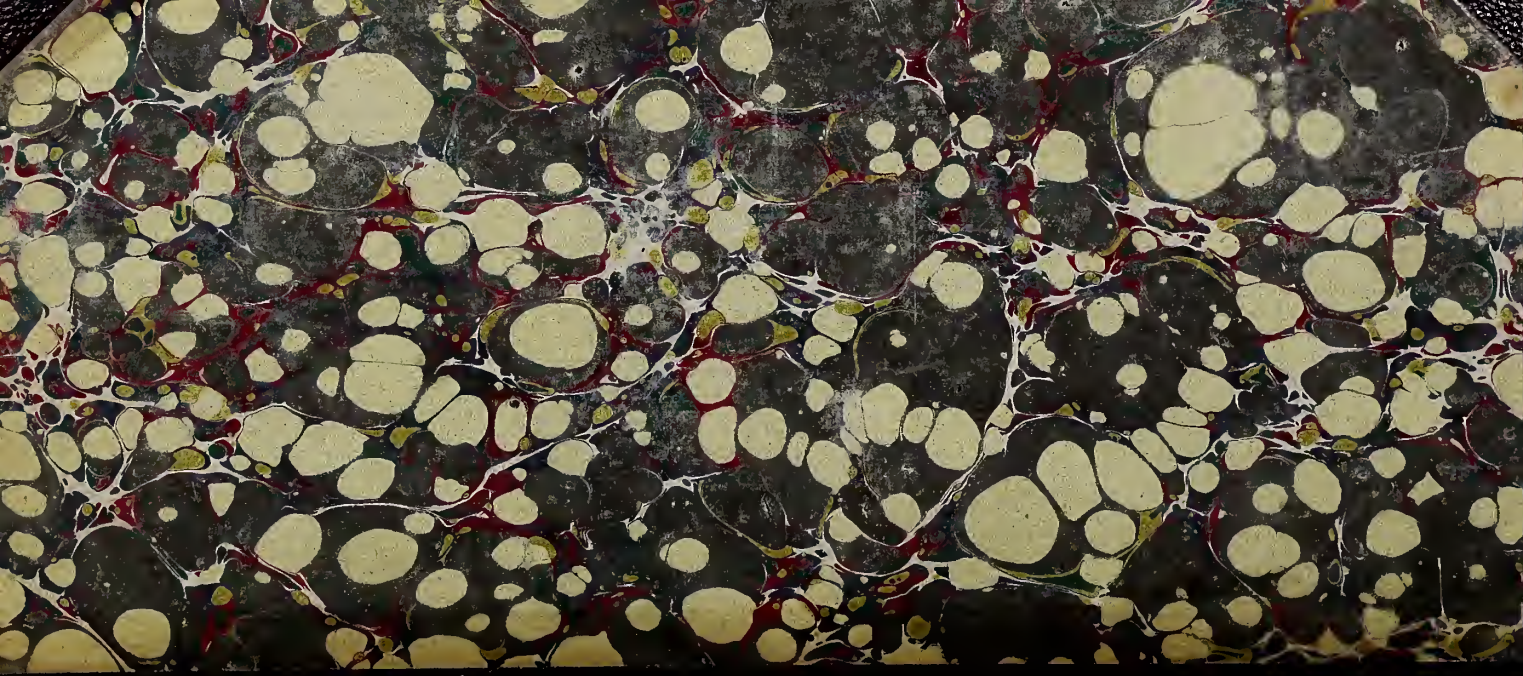


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Chirocentrus dorab, (Forskal.)

Clupea dorab, Forskâl, 72, No. 108.
Clupea dorab, Linné: Syst. 1409.
Clupea dorab, Lacépède.
Esoce chirocentre, Lacépède, V. Pl. 8, Fig. 1.
Clupea dentex, Bloch-Schneider, 428.
Clupea dorab? Russell, CXCIX. Wallah.
Clupea dorab, Shaw, V. 175.
Chirocentrus dorab, Cuv. R. A. II. 326 (1).
Chirocentrus dorab, Rüppell: Neue Wirb. Fische, 81.
Chirocentrus nudus, Swainson, II. 295.
Chirocentrus dorab, Richardson, Report, 1845, 311.
Chirocentrus dorab, Cuv. and Val. XIX. 150, Pl. 565.
Chirocentrus dorab, Bleeker: Verh. Batav. Gen. XXII. 6.
Párang-Párang of the Malays.

Head above and back intense blue with sea green reflections; rest of the head and body shining silvery; fins hyaline, caudal and pectorals dotted with black; in some the caudal margins and the upper ray of the pectorals black; tongue black. Iris silvery; orbital margin bluish black.

D 16 or 17, C $19\frac{7}{7}$, A 33 or 34, V 6 or 7, P 14 or 15, Br. VIII.

Habit.—*Sea of Malayan Peninsula and Islands.*

Zanzibar, Isle of France, Red Sea, Muscat, Malabar, China Sea, Isle of Buru, New Guinea, Celebes, Madura, Java, Sumatra, Coromandel, Bay of Bengal, Gangetic estuaries.

Total length: 6 feet.

The length of the head is $6\frac{1}{2}$ in the total; the depth at occiput $\frac{3}{4}$ of the length. The horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the distance across the forehead $\frac{3}{4}$ of the diameter. The vertical diameter at the ventrals slightly exceeds the length of the head. The lower caudal lobe is frequently a little longer than the upper, and exceeds by $\frac{1}{4}$ the length of the head. The fish is numerous at all seasons on the Malayan coasts. Individuals six feet in length are at Pinang of rare occurrence. Although not eaten by Europeans, this fish is highly valued by the natives of the different countries where it is found. The Malays denominate it from the resemblance of the large teeth to their favourite chopping knife *(párang)* and they apos-

trophize it in a popular epigrammatic stanza ("pantun,") quoted by Colonel James Low. (Dissertation on Pinang, &c. p. 181.)

Gen. Chanos, *(Lacép.* 1803*) Valenciennes,* 1846.

(Lutodeira, [*v. Hasselt,*] *Rüppell,* 1828.)

Mouth toothless; dorsal single; pectorals and ventrals enclosed by elongated scaly appendages; on each side of the deeply cleft caudal two scaly semilunar laminæ, each horizontally fixed to the upper and lowermost of the short, horizontal central rays; abdomen rounded; inside of œsophagus, lined by a spiral ridge the sides of which with numerous rounded papillæ, the margin with distant elongated papillæ; outside of œsophagus marked by a corresponding spiral linear impression; numerous appendicula cœcopylorica; intestinal canal very long.

Chanos pala, (Cuvier.)

Russell, CCVII. Palah Bontah.*

Cyprinus (Leuciscus) pala, Cuv. R. A. II. 276 (').

Chanos nuchalis, Cuv. and Val. XIX. 197.

(Adult.) Head above and back glossy intense blue; sides above the lateral line lighter, silvery with green reflections, becoming paler immediately beneath the line; rest of the sides and abdomen silvery white; lips pale brownish; cavity of the mouth and tongue bluish white sparingly dotted with black; sides of the head shining silvery with lilac and rose-coloured reflections; dorsal and caudal rays greyish white, and as well as their pale brownish membrane minutely dotted with brown; both fins broadly edged with blackish; the caudal semilunar laminæ pale horn-colour; pectorals and ventrals white, with the anterior half of their external surface powdered with blackish brown, their elongated scaly appendages shining silvery; anal white, anterior half sparingly dotted with black. Iris silvery, orbital half pale brownish.

(Young.) Differs by the hyaline fins, of which the dorsal and caudal are but sparingly dotted with brown.

* In Mr. Jerdon's memoir "*On the Fresh Water Fishes of Southern India,*" in the *Madras Journal,* Vol. XV p. 344, the author refers a species of *Albula* ("*Butirinus maderaspatensis,* Jerdon") to Russell, No. CCVII. As the latter belongs to a genus very distinct from *Albula (Butyrinus,* vide infra), Russell's species cannot be identical with "*Butyrinus maderaspatensis.*"

D 15, C 19$\frac{8}{8}$, A 11, V 11, P 16, Br. IV.

HABIT.—*Sea of Pinang, Malayan Peninsula.*

Vizagapatam, Madras.

TOTAL LENGTH : 2 feet.

The length of the head is $5\frac{1}{2}$ in the total; but in the very young $4\frac{2}{3}$. The depth at occiput is $\frac{2}{3}$ of the length of the head. The eye, bordering upon the profile, is situated a little in front of the second third of the head. The horizontal diameter is $3\frac{1}{3}$ in the length of the head. The distance across the forehead slightly exceeds the diameter. The thick adipose fold has a circular pupillary opening. In the young the eye is comparatively larger, the horizontal diameter slightly exceeding $\frac{1}{3}$ of the head. The symphysis of the lower jaw carries a small rounded tubercle fitting into a corresponding notch of the upper, behind which is suspended a narrow crescent-shaped membrane. The small tongue is elongated and immoveable. The greatest vertical diameter, in front of the dorsal, is a little less than the length of the head. The deepest portion of the body is covered by 26 longitudinal series of scales; the first six to eight scales of each series, above as well as beneath the lateral line, are indeed somewhat larger than all the rest, but the size gradually decreases, and not abruptly, as represented in the figure of Russell. The latter is also incorrect in confining the larger and striated scales to the space *above* the lateral line, and the number of the longitudinal series is incorrect. The lateral line, composed of simple central tubes, declines towards the termination of the pectoral, from whence it continues straight on the thirteenth longitudinal series of scales to the middle of the caudal. It occupies 77 scales. The dorsal fin commences exactly in the middle between the muzzle and the root of the longest ray of the upper caudal lobe. The first three rays are undivided and gradually increase in length; the fourth, the longest, is $\frac{3}{4}$ of the length of the head. The upper margin of the fin is crescent-shaped, the last ray being elongated and nearly double the length of the penultimate. The base is enclosed between two series of elongated, obliquely set scales, of which there are thirteen on each side, gradually increasing in length so as to cover the lower half of the posterior rays. The caudal is deeply cleft, the lobes are $3\frac{1}{2}$ in the total length; in one individual the upper slightly exceeded the lower. The vertical diameter of the tail at the root of the caudal, is about $\frac{1}{3}$ of the length of the

head. The semilunar laminæ are closely pressed to the fin, with the free convex margin towards the lateral line; the length of the straight margin or base is $\frac{4}{5}$ of the horizontal diameter of the eye. In the adult the vertical diameter of the laminæ is $\frac{1}{4}$ of the diameter of the eye, but in the young it is less. The extent of the base of the anal fin equals its distance from the root of the caudal; the anterior ray is very small and, as well as the second and third, undivided; the last ray is the longest, terminating in a narrow point, its length $\frac{1}{3}$ of the head. The base like that of the dorsal is enclosed between two series of elongated scales of which the last half covers the corresponding ray. The ventrals commence opposite the posterior half of the dorsal, or halfway between the first pectoral and the last anal ray. The first ventral ray slightly exceeds $\frac{1}{2}$ the length of the head; the outer scaly appendage is nearly $\frac{2}{3}$ of the first ray; the inner one is much shorter and broader, triangular. The pectorals commence close to the abdomen, immediately behind the gill-opening; the first ray is about $\frac{2}{3}$ of the length of the head. The outer scaly appendage is very long, $\frac{3}{4}$ of the first ray; the inner one is broader and but half the length of the former. At Pinang single individuals occur at all seasons, and are highly valued for their very delicate flavour. The œsophagus is spindle-shaped, fleshy, exceeding half the length of the head by $\frac{1}{5}$. The external surface is smooth, with a spiral, linear impression, corresponding to the internal spiral ridge, which makes 21 very oblique turns. The ridge is of a triangular form, both sides are divided by numerous backwards-directed linear ridges, each of which carries a great number of small, soft, pointed papillæ; the free margin towards the cavity of the œsophagus is smooth, but on that of the fourteen anterior turns appear some distant-pointed, backwards-directed papillæ, which are much longer than those of the sides. The stomach consists of two portions, of which the anterior is cylindrical, narrow at cardia, bent like a double horse-shoe, and then joins the short, pyriform posterior portion. The latter is very fleshy, hard, gizzard-like. Both portions are lined by 6 to 10 longitudinal rather large folds; towards pylorus the coats are very thick, forming there two rounded hard protuberances. The length of the stomach slightly exceeds $3\frac{3}{4}$ in the total. In one examined it contained some remains of vegetable matter, and green mucus. The duo-

denum is surrounded by numerous appendicula cœcopylorica, each of which divides in two or more portions, of which an innumerable mass, extending about $1\frac{4}{8}$ inches from pylorus, envelops the intestine. Those nearest the pylorus are the longest, about one inch in length. The intestines, throughout of nearly uniform diameter, form many circumvolutions; from pylorus their length is about $3\frac{1}{2}$ times that of the fish; but including œsophagus and the stomach, the length of the entire intestinal canal is a little less than four times the total length of the fish. The liver and the spleen are very large, the former elongated single-lobed; the latter of a beautiful black with purple reflections. The air-vessel is very large, spindle-shaped, terminating behind in an elongated point; the anterior margin is straight with a short pointed process on each side. It communicates with the anterior portion of the stomach through a short canal proceeding from the anterior part of the lower surface. Its coats are very thin, white, covered by the black peritoneum. In a male, 2 feet in total length, the intestinal canal was of the following dimensions.

Œsophagus,	0 feet	$2\frac{4}{8}$ inch.
Anterior portion of stomach,	0 „	5 „
Posterior do.	0 „	$1\frac{4}{8}$ „
Intestines,	7 „	$0\frac{4}{8}$ „
	7 feet	$9\frac{4}{8}$ inch.

The description and figure of Russell, No. CCVII. *Palah Bontah*, establish beyond doubt the identity of the present species, which Dr. Rüppell believes to be identical with *Mugil chanos*, Forskål. The figure of *Lutodeira chanos*, Rüppell* gives indeed the exact proportions of the fish observed at Pinang, and the anatomical details, the singular structure of the œsophagus and stomach of which Dr. Rüppell gave the first account, also correspond. But the length of the intestinal canal has been omitted, and till that is known, the identity cannot be decided. M. Valenciennes considers Russell's *Palah Bontah* to be distinct from *Mugil chanos*, Forskål in consequence of the eight or nine

* Atlas, 18, Tab. 5, Fig. 1. Syn. *Mugil chanos*, Forsk. 74, No. 110.—*Mugil salmoneus*, J. R. Forster, Msc. IV. 14.—*Chanos arabicus*, Lacép. V. 395,—*Palah Bontah*, Russell, CCVII.—*Lutodeira indica*, Van Hasselt, apud Ferrusac.

oblique series of larger scales immediately behind the head. But, as observed above, Russell's figure is not correct; besides, it appears from references to Russell's figure of *Lutodeira chanos*, to M. Valenciennes' of *Chanos lubina*, (XIX. Pl. 567,) and lastly from inspection of a young individual of *Chanos tolo*, (Cuvier,) that also these species present behind the head a few series of scales a little larger than the rest. Leaving this character aside, the present species offers an anatomical difference from *Mugil chanos*, Forskål,* of which according to M. Valenciennes the intestinal canal, from pylorus, measures eight times the length of the body. As observed above, in the present species the canal is about $3\frac{1}{2}$ times, and with œsophagus and the stomach, a little less than four times the total length.

Chanos tolo, (Cuvier.)

Russell, CCVIII. Tooleloo.

Cyprinus tolo, Cuvier, R. A. II. 276 (').

Chanos chloropterus, Cuv. and Val. XIX. 195.

Young. Head above and back intense blue, lighter, silvery with green reflections above the lateral line; the rest and abdomen silvery white; sides of the head shining silvery with lilac reflections; fins yellowish white, dorsal and caudal minutely dotted with black, giving the margins a blackish appearance. Iris silvery, orbital margin blackish.

D 17, C $19\frac{8}{8}$, A 10, V 11, P 15, Br. IV.

Habit.—*Sea of Pinang.*

River of Madepollam (Godavery).

Total length: $4\frac{6}{8}$ inch.

This species greatly resembles *C. pala*. It differs, however, in the following characters. The dorsal fin is placed a little farther forwards, the first ray, undivided as well as the succeeding four, rises in the centre between the muzzle and the commencement of the upper caudal lobe. The ventrals also are situated a little more forwards; the first ray commences at equal distance from the first pectoral and the eighth anal ray. The extent of the base of the anal is shorter than the space between the last anal ray and the root of the lower caudal lobe. In front of the dorsal fin the body is covered by 24 longitudinal series of

* *Chanos arabicus*, Cuv. and Val. XIX. 187.

scales, of which the lateral line occupies the eleventh from above. The scales of the oblique series behind the head are a little larger than the rest, which although they appear smaller than in *C. pala*, are not so proportionally, nor does Russell's figure represent them so. The four caudal semilunar laminæ resemble those of the former species. A single young individual was taken in a fishing-stake off the coast of Pinang in March 1845. The fishermen asserted that it is an inhabitant of rivers, and but rarely enters the sea.

Gen. Albula, (*Gronov.* 1763) *Valenciennes*, 1846.

(Butyrinus, [*Commerson*] *Lacép.* 1803.)

Body fusiform, covered with numerous hard, firm scales, disposed in longitudinal series; one such before and behind the dorsal fin, (on the keel of the back) of a little larger scales*; head large, naked, above with the grooves between the keels of the bones appearing through the skin; eye with a thick adipose lid; muzzle conical, pointed, projecting far beyond the lower jaw; dorsal small, ventrals commencing opposite the posterior part of the latter; card-like teeth in the upper intermaxillaries and the lower jaw, on the vomer palatals and pharyngeals; small globular teeth on the spheroid, pterygoid, and hyoid bones.

Albula erythrocheilos, Cuv. and Val.?

Albula erythrocheilos, Cuv. and Val. XIX. 352, Pl. 540?

Head above and back blackish silvery; sides and abdomen frosted silvery, the edges of the scales shining; infraorbitals and opercles brilliant silvery; on each side of the yellowish white muzzle a short backwards and downwards directed black line, not, however, joining its neighbour on the lower surface; in the small groove containing the apertures of the nostrils a minute crescent-shaped black spot bordering the anterior half of the apertures; a gamboge line from the posterior part of the second infraorbital borders above the single series of scales and extends to the anterior margin of the preopercle; margin and cavity of the mouth white; dorsal rays yellow, their upper fourth blackish; membrane pale brownish dotted with black; caudal yellow, posterior

* In the species here described they are not larger than the rest.

margin blackish; anal silvery hyaline; ventrals hyaline, rays of the anterior half and the pectorals bright gamboge. Iris silvery, orbital margin pale golden.

D 18 or 19, C 19$\frac{8}{8}$, A 8 or 9, V 11, P 17 or 18.

Br. *left* XIV, *right* XIII.
or „ XVI, „ XV.

Habit.—*Sea of Pinang.*

Total length: 9$\frac{4}{8}$ inch.

The length of the head is 4$\frac{1}{2}$ in the total; the depth at occiput slightly exceeds half the length. The parietal protuberances and the posterior keels of the frontal bones are sufficiently developed to make the space between them appear hollowed; the sutures of the frontals and parietals form an acute angle in front of the eye; the frontals are slightly convex; the internal cavernous keels are sharp, so as to deepen the narrow central groove. The nostrils open a little behind the second half between the muzzle and the eye; they are situated in a small oval longitudinal groove, the upper and lower margins of which are raised, so as to form sharp keels, the upper one of which rises on the profile like a short arch. The eye occupies the middle of the side of the head, bordering on the profile, which is slightly arched by the lateral part of the frontal bone which forms the roof of the orbit. In front of the anterior part of the orbital margin of the frontal appears a narrow bone, analogous to the supraorbital of *Cyprinoidæ*. The horizontal diameter of the eye is 4$\frac{1}{2}$ in the length of the head, of which the distance across the forehead is but $\frac{1}{4}$. The thick adipose fold covering the eye has a vertically elliptical aperture corresponding to the pupil which, however, is circular. In form the seven infraorbital bones and the opercles resemble those of *Albula macrocephala*, (Lacép.) Between the cheek and the horizontal part of the preopercle appears a single series of 7 to 9 scales, but little smaller than those of the body. The tongue and teeth resemble those of the latter species. In the adult there are no teeth on the upper maxillary bone, but in an individual 8$\frac{4}{8}$ inch in length, four small pointed distant teeth appeared along the margin of the left branch, and on the right two immediately behind the intermaxillary, and one tooth close to the angle of the mouth. A small accessorian maxillary appears at the posterior margin of each branch. The thin narrow interopercle is arched, with the convex

margin downwards, occupying the sides of the throat. In four individuals examined the left branchiostegous membrane overlapped the right and presented one additional ray. Two measuring $9\frac{4}{8}$ inch, and one $8\frac{4}{8}$ inch in length, had 16 branchiostegous rays in the left, 15 in the right membrane. A fourth, $9\frac{4}{8}$ inch in length, had 14 in the left, 13 in the right membrane. The two or three anterior rays are short, linear, and not sabre-like as the rest, and as they are hid by the lax membrane, they may easily escape observation, unless they are brought to view by dissection. The greatest vertical diameter of the body, in front of the dorsal, is $\frac{1}{6}$ of the total length. The scales are disposed on 15 longitudinal series, and in general form resemble those of *A. macrocephala*, (Cuv. and Val. XIX. Pl. 573.) Examined through a compound microscope, (385 linear), the longitudinal striæ appear to be composed of horse-shoe-like protuberances, not of bead-like strings, as in *macrocephala*. The lateral line occupies the ninth series; it follows for a short distance the gill-opening, and then continues straight in the middle of the side to the root of the caudal. It is composed of simple central tubes, on 72 to 78 triangular scales, somewhat smaller than the rest. All the fin-membranes are covered by minute oblong scales, either transparent or silvery. The dorsal fin commences a little in front of the centre between the muzzle and the root of the caudal. The central series of scales of the back are not larger than the rest, but on the contrary, somewhat smaller. The ventrals commence not behind the posterior dorsal ray, but opposite the 13th or 14th. In form all the fins resemble those of *A. macrocephala*, but the upper caudal lobe, equal the length of the head, is longer than the lower. In three individuals the difference scarcely exceeded $\frac{1}{8}$, but in a fourth the lower lobe was but $\frac{2}{3}$ of the upper one. The stomach is elongated cylindrical, capacious, very thin. It contained remains of small shrimps. Round the pylorus appear fourteen large appendicula cœcopylorica. The intestinal canal is simple, little more than half the total length of the fish. The other viscera resemble those of *A. macrocephala*. Four individuals were taken in February 1845 in fishing-stakes off the coast of Pinang. The fishermen, evidently not well acquainted with the species, asserted it to be of rare occurrence, and highly valued. Out of water it soon expires and becomes soft. This fish nearest agrees with *A. erythrocheilos*. It differs in the

number of branchiostegous rays, but as M. Valenciennes drew up his description from a single specimen, and as the character is liable to individual variations, it is without actual comparison of specimens not sufficient to distinguish species, which so nearly resemble each other as those of the genus *Albula*.

Gen. Dussumieria, *Valenciennes*, 1847.

Form of the body resembling Gen. *Sardinella*, but the abdomen smooth, not toothed; fine teeth in the jaws, on the tongue, palatal and pterygoid bones; those of the two latter resembling a fine rasp.

Dussumieria acuta, Cuv. and Val.

Dussumieria acuta, Cuv. and Val. XX. 467, Pl. 606.

Támban bulat of the Malays.

Head above, back and upper third of the sides deep glossy blue, bordered by a longitudinal band of pale copper-red; the rest of the head and body shining silvery; dorsal hyaline, minutely dotted with black along the base; caudal whitish or yellowish minutely dotted with black, posterior margin blackish; rest of the fins hyaline; jaws minutely dotted with black: symphysis of the upper jaw black; on each side of that of the lower a short dotted black line; tongue bluish, dotted with black. Iris silvery, orbital margin blackish.

D 19 to 21, C $19\frac{5}{5}$, A 14 to 17, V 8, P 13 or 14, Br. XV.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Malabar, Coromandel, Bencoolen.

Total length: 6 inch.

The length of the head is contained $4\frac{3}{4}$ times in the total; the depth at occiput $2\frac{1}{2}$ in the length of the head. The eye, bordering on the profile, occupies the middle of the head; the horizontal diameter is $\frac{1}{3}$ of the length of the head; the distance across the forehead $\frac{3}{4}$ of the diameter; the thick adipose fold covering the eye has a small circular pupillary opening. The left branchiostegous membrane slightly overlaps the right, but the number of the rays of both is equal. The greatest vertical diameter in front of the dorsal is $5\frac{1}{2}$ in the total length. The scales are small, rounded and very deciduous. The dorsal fin commences at equal distance from the muzzle and the centre of the posterior caudal margin. Single individuals of this species occur at Pinaug at all seasons, but

numbers from June to September. It is highly valued for its delicate flavour, and passes commonly as a 'Sardine.' The latter denomination it shares, however, with *Clupeonia perforata*, (vide infra,) with which it is also confounded by the Malays under the common name of *Ikan tamban*. Both species have been prepared as 'Sardines à huile.'

GEN. ELOPS, (*Linné*, 1766.) *Cuv. and Val.* 1846.

(MEGALOPS, *Lacépède*, 1803).

Branchiostegous rays remarkably numerous; a single bony plate between the branches of the lower jaw under the branchiostegous membrane; gape very large; intermaxillaries short; maxillaries long, free; both, as well as the palatals, vomer, pterygoids, sphenoids, lower jaw, lingval and hyoid bones covered with fine velvety teeth; body elongated, and as well as the abdomen, rounded; above and below at the root of the caudal a more or less elongated, spine-like scale; pectorals and ventrals with an elongated scaly appendage; last dorsal ray in some terminating in an elongated filament.

ELOPS SAURUS, Linné.

The Pounder, Sloane: Hist. of Jamaica, 284, Pl. 251, Fig. 1.
Argentina machnata, Forskål, 68, No. 100.
Elops saurus, Linné: Syst. 1394.
Argentina carolina, ibid. 1395.
Mugilomore anne-caroline, Lacép. V. 398.
Russell, CLXXIX. Jinagow.
Argentina machnata, Shaw, V. 129.
Argentina carolina, ibid.
Elops inermis, Mitchill: Trans. Lit. and Phil. Soc. New York, I. 445.
Elops machnata, Cuv. R. A. II. 324 (').
Elops machnata, Rüppell: Neue Wirbelth. Fische, 80.
Elops indicus, Swainson, II. 292.
Elops saurus, De Kay: Zool. New York, III. 267, Pl. XLI. Fig. 131.
Elops machnata, Richardson: Report, 1845, 311.
Elops machnata, Richardson: Ichthyol. Erebus and Terror, Pl. XXXVI. Figs. 3, 4, 5.
Elops saurus, Cuv. and Val. XIX. 365.
Elops saurus, Bleeker: Verh. Batav. Gen. XXII. 6.

(Young). Head above silvery green; back dark-blue, light bluish green on the sides above the lateral line; the rest of the body and head shining silvery; dorsal membrane yellowish white, minutely dotted with brown, anterior margin black, and the anterior two thirds of the upper margin broadly brimmed with black; anterior half of pectorals and ventrals gamboge, anal and caudal hyaline; the latter with the upper and lower margin blackish. Iris silvery.

D 24, C $19\frac{6}{6}$, A 17, V 15, P. 19; Br. *left* XXX, *right* XXIX.*

Habit.—*Sea of Pinang.*

Isle of France, Java, Celebes, Madura, Red Sea, Coromandel, China Sea, Japan, Senegal, New York, New Orleans, St. Domingo, Martinique, Mexico, Surinam, Brazil.

Total length: 11 inch.

The length of the head is $\frac{1}{4}$ of that of the body, the caudal not included, or with the latter $4\frac{4}{5}$ times in the total. The length at occiput is $\frac{1}{2}$ of the length of the head. The eye bordering on the profile, occupies the second fourth of the head, the horizontal diameter is a little less than $\frac{1}{4}$ of the head; the distance across the forehead is a little less than $\frac{2}{3}$ of the diameter. The adipose fold surrounding the orbit forms a large circular opening, corresponding to the pupil. The left branchiostegous membrane overlaps the anterior half of the right. The elongated bony plate between the branches of the lower jaw exceeds by $\frac{2}{8}$ the horizontal diameter of the eye. The greatest vertical diameter, in front of the dorsal, is $\frac{1}{8}$ of the total length. The lateral line is composed of a simple central tube on each scale. It follows nearly the middle of the side, proceeding straight to the centre of the posterior margin of the caudal. The stomach of a solitary young individual, observed at Pinang in February 1845, contained remains of small Crustacea and Fishes.

* Russell, ...	D 22,	C 28,	A 14,	V 14,	P 17, Br. XXX.
Rüppell, . ..	,, 23,	,, $19\frac{5}{6}$,	,, 16,	,, 15,	,, 19, ,, XXVIII or XXIX.
Cuv. and Val.	,, 23,	,, 31,	,, 15,	,, 15,	,, 18, ,, XXIX, or XXXV.
De Kay, .. .	,, 24,	,, $20\frac{6}{6}$,	,, 17,	,, 14,	,, 15.
Richardson,..	,, 24,	,, $19\frac{7}{8}$,	,, 17,	,, 14,	,, 17, ,, XXXII.

ELOPS CUNDINGA, (Buchan. Ham.)

Clupea cyprinoides,* Broussonnet: Decade.
Clupea cyprinoides, Joh. Forster: Spicil.
Clupea apalike, Lacépède, V. Tab. 13, Fig. 3.
Russell, CCIII. Kundinga.
Cyprinodon cundinga, Buchan. Ham. 254, 383.
Megalops filamentosus, Cuv. R. A. II. 324.
Megalops filamentosus, Swainson, II. 293.
Megalops indicus,† Cuv. and Val. XIX. 388, Pl. 577.
Megalops filamentosus, Jerdon: Madras Journ. XV. 344.
Megalops indicus, Bleeker: Verh. Batav. Gen. XXII. 6.

Head above dark olive; back blackish blue silvery; sides and abdomen frosted silvery with bluish reflections, the lateral line and the margins of the scales shining silvery, as well as the sides of the head; above the upper margin a large blackish silvery spot; centre-part of both jaws blackish; dorsal and caudal greyish, minutely dotted with black, margins as well as the last elongated dorsal ray blackish; rest of the fins hyaline, in some dotted with black, and the last anal ray blackish. Iris shining silvery, orbital margin blackish.

‡D 19 or 21, C $19\frac{6}{6}$, A 26, 27 or 28, V 10 or 12, P 15 or 16,
Br. *left* XXVI, *right* XXV.
or „ XXV, „ XXIV.

HABIT.—*Sea and freshwater, Pinang, Malayan Peninsula.*
Freshwater and coasts of Otaheiti, Isles of Tanna and Buru, China Sea, Port Essington, Polynesia, Madagascar; Rivers of Java, freshwater and Sea of Madura, Celebes, Malabar, Coromandel, Gangetic estuaries.

TOTAL LENGTH: 1 foot.

* M. Valenciennes has fully exposed (XIX. 384) the confusion of the Indian and American species by Broussonnet, Bloch, Gmelin, Bonaterre, Lacépède and Shaw, whose specific names are therefore inadmissible.

† *Elops indicus*, preoccupied, being one of the synonymes of *Elops saurus*, Linné, (vide supra.)

‡ Russell,..... D 18, C 26, A 25, V 9, P 15, Br. XXIII.
Buchanan,.... „ 19, „ 19, „ 26, „ 10, „ 15, „ XXV.
Cuv. and Val., „ 18, „ 30, „ 25, „ 11, „ 14, „ XXIV—XXV.

The length of the head is $4\frac{2}{3}$ in the total; the depth at occiput $\frac{3}{4}$ of the length. The horizontal diameter of the eye is $2\frac{3}{4}$ in the length of the head, the distance across the forehead is $\frac{2}{3}$ of the diameter. The greatest vertical diameter, in front of the dorsal, equals the length of the head. The scales are disposed on twelve longitudinal series, of which the sixth carries the lateral line. The latter declines towards the dorsal from whence it continues straight to the caudal. In the adult it occupies from 38 to 41 scales, each carrying a rather indistinct central tube, from above and below which radiate backwards from six to eight fine branches. The left branchiostegous membrane partially overlaps the right. The elongated bony plate between the branches of the lower jaw slightly exceeds the horizontal diameter of the eye. Of the anterior dorsal rays the fourth or the seventh is the longest, about $\frac{2}{3}$ of the length of the head. The last dorsal ray is divided in two portions of which the posterior is again divided in two filaments, provided in front and behind with a narrow loose membrane. The filament in some reaches the root of the caudal, but it is frequently much shorter, particularly in old individuals. A young one, $4\frac{1}{8}$ inch in length, differed in, contrary to the generality of fishes, having the eye proportionally smaller than the adult; the lateral line, occupied but 29 scales, each carrying a very distinct central tube with two or three short spine-like branches; the dorsal filament was very short, its length less than the longest of the anterior rays; the left branchiostegous membrane contained but 23 rays, the right one less, and the colour of the head and back were paler than in the adult. At Pinang single individuals are taken at all seasons in the fishing-stakes off the coast; but those inhabiting fresh-water are numerous. In both localities their food is small fishes and crustacea, but in the latter they also prey upon insects. Notwithstanding their numerous fine bones they are valued for their flavour, which loses nothing by their being introduced in tanks where they rapidly multiply and fatten. M. Valenciennes considers *Megalops setipinnis*, Richardson,* to be identical with, and *M. curtifilis*, Richardson,† to be the young of the present species.

* *Ann. Nat. Hist.* X. 493, and *Report*, 1845, 310.

† *Report*, 1845, 310.

Gen. Pellona, *Valenciennes*, 1847.

(Platygaster,* *Swainson*, 1839.)

Teeth in the jaws, on the palate, pterygoid bones and on the tongue, but not in the vomer; body compressed; ventrals in front of the dorsal; anal elongated; abdomen strongly toothed; air-vessel communicating with œsophagus by a small tube inserted at the extremity of the stomach.

Pellona affinis, (Swainson.)

(Icon.) Clupea affinis, Gray: Illustr. Ind. Zool. I, Pl. 96.

Platygaster affinis, Swainson, II. 294.

Clupea (Ilisha) affinis, Richardson, Report: 1845, 206. Note.

Pellona grayana, Cuv. and Val. XX. 315.

Head above and back greyish green minutely dotted with black; lighter, silvery above the lateral line; rest of the sides, abdomen, cheeks and opercles silvery; dorsal, caudal and anal yellow; the external half of the two former minutely dotted with black; rest of the fins hyaline. Iris silvery, orbital margin blackish.

D 16, C $19\frac{3}{3}$, A 50 to 52, V 7, P 15, Br. VI.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

China Sea, Bay of Bengal.

Total length: 1 ft.

The length of the head is $\frac{1}{5}$ of the total. The horizontal diameter of the eye is $4\frac{1}{2}$ in the length of the head; the distance across the forehead slightly exceeds one diameter. The greatest vertical diameter, in front of the dorsal, is $3\frac{3}{4}$ in the total length. The dorsal commences in the middle between the muzzle and the centre of the posterior caudal margin. The caudal lobes are equal: $\frac{1}{6}$ of the length of the head. The anal commences opposite the posterior fourth of the dorsal. The small ventrals are situated opposite the second third of the distance between the muzzle and the root of the caudal. Smaller individuals of this species are numerous at Pinang at all seasons, and are consumed fresh or dried by the natives.

* Preoccupied by *Platygaster*, Latreille, 1809 *(Hymenoptera)*.

Gen. Raconda, *Gray.**

Dorsal fin none; rest like *Pristigaster*.

Raconda russelliana, Gray.

Raconda russelliana, Gray: Zool, Miscell. 9.

(Icon.) Apterygia ramcarate, Gray: Ill. Ind. Zool. II. Pl. 92, Fig. 1.

Pristogaster (Apterygia) Swainson, I. 277.

Apterygia hamiltonii, Cuv. and Val. XX. 333.

Head above and back deep blue, upper third of the sides polished copper-coloured; rest of head and body shining silvery with mother-of-pearl reflections. Behind the upper part of the opercle a black spot; caudal pale yellowish minutely dotted with black, particularly towards the posterior margin; anal and pectoral rays yellowish or white, membranes hyaline. Iris silvery, orbital margin blackish blue.

D 0, C 19$\frac{3}{3}$, A 83 or 84, V 0, P 12, Br. VI.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Bay of Bengal, Mouths of Ganges.

Total length: 8 inch.

The length of the head is 6$\frac{1}{3}$ in the total. The horizontal diameter of the eye is 3$\frac{1}{3}$ in the length of the head; the distance across the forehead is $\frac{2}{3}$ of the diameter. The eye occupies the middle of the length of the head, and is situated close to the concave profile without bordering upon it. The infraorbital is narrow, elongated, much too short to cover the maxillary. The intermaxillaries are short, narrow, linear and fixed transversely across the muzzle. The upper maxillary bone is much longer and broader than in *Pristigaster tartoore;* when the mouth is opened it projects beyond the throat, and when closed it

* What has been published of this species appears to be confined to the figure in *Hardwicke's Illust. of Ind. Zool.* of *Apterygia ramcarate*, and a very short notice in *Zoological Miscellany*. But for the absence of the dorsal fin, the resemblance to *Pristigaster tartoore*, Cuvier, (Russell, CXCIII. Tartoore,) is so striking, that it is not surprising, that M. Valenciennes should have considered the undescribed figure of *Apterygia ramcarate* ("*hamiltonii*," as quoted in *Hist. des Poiss.* XX. 333,) to represent a mutilated specimen of *Pristigaster tartoore*. The following is Mr. Gray's description of Raconda russelliana: "*Silvery; Saugar Roads. A species distinguished from the want of the fin by the fishermen; there are two specimens in British Museum, neither shewing the slightest indication of that organ.*" (Zool. Miscell. l. c.)

extends to opposite the posterior margin of the orbit; the length is $\frac{1}{2}$ of that of the head, the breadth $\frac{2}{3}$ of the diameter of the eye; the upper extremity is obliquely truncated, the lower forms a rather long, slightly backwards arched point. The lower jaw projects a little beyond the upper, which the branches equal in breadth, but they are shorter. The teeth of both jaws are very minute and placed in a single series; the rest are velvety or like a fine file. The mouth is small; the tongue free, flattened, oval. The opercle is triangular with the posterior extremity rounded or less pointed than in *P. tartoore*. The preopercle is narrower, and scarcely broader than the arched subopercle and interopercle, which two latter are proportionally broader in the present species. The branchiostegous membrane is small; its two anterior rays short and slender; the posterior four broad and flattened. The profile of the head is concave, rising to a little behind the occiput, from whence the back gently declines towards the root of the caudal. The abdominal arch continues increasing towards the root of the anal, from whence the profile gradually ascends. The greatest diameter of the body, at the root of the pectorals, slightly exceeds $\frac{1}{5}$ of the total length; at the occiput it is $\frac{1}{6}$; at the root of the caudal it is about $\frac{1}{3}$ of the length of the head. The lateral line commences high up from the supra-scapular bone, and continues close to the profile of the anterior third of the back when it suddenly terminates. Another fine line follows the upper fourth of the side to the root of the caudal. The scales are of moderate size, oval, excessively thin and so deciduous, that the exact number cannot be ascertained. The trenchant abdominal profile contains upwards of 38 spines. The caudal is deeply cleft, the lower lobe, longer than the upper, equals the length of the head. The distance from the muzzle to the anal is $2\frac{1}{2}$ in the total length. The extent of the base is $\frac{1}{2}$ of the total length, (in *P. tartoore* it is little more than $\frac{1}{3}$,) the length of the rays does not exceed the horizontal diameter of the eye. The first pectoral ray, the longest, is situated nearly in the centre of the vertical diameter; it is broad, sword-like, with distinct articulations; its length is a little less than the head. At Pinang individuals from 4 to 6 inches in length are numerous at all seasons, although less so than they are at the Sandheads and the mouths of the Ganges. The Bengal fishermen denominate the species "*Potassah-Fessah* or *-Phasah*." "*Fessah*" or "*Phasah*," as Buchanan Hamilton observes, is in Bengal a

generic term, particularly applied to *Engraulis phasah* (Buchan.) and *E. telarah*, (Buch.) It is a heavy swimmer, and like the rest of *Clupeoidæ*, expires immediately on leaving its element. It is chiefly consumed in a dried state.

Gen. Clupeonia, *Valenciennes*, 1847.

Teeth on the tongue and pterygoid bones; palatals, vomer and jaws* toothless.

Clupeonia perforata, Cantor.

Támban népis, or Támban bátul of the Malays.

Head above yellowish green; back and upper third of the sides bluish green with silvery reflections; muzzle and chin blackish; rest of the head and sides and abdomen shining silvery with rose-coloured and ultramarine reflections; dorsal bright yellow, upper half minutely dotted with black; a black spot over the root of the anterior four rays; caudal pale bluish green, posterior half minutely dotted with black; rest of the fins white. Iris silvery, orbital margin black.

D 17 to 20, C $17\frac{6}{6}$, A 19 or 20, V 8, P 15, Br. V.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Sumatra.

Total length: $5\frac{6}{8}$ inch.

The general form is elongated, compressed; the abdomen is slightly more arched than the back. The length of the head is $\frac{1}{5}$ of the total; the eye is placed a little nearer the muzzle than the gill-opening; the horizontal diameter is a little less than $\frac{1}{3}$ of the head, but equals the distance across the forehead. The muzzle is bluntly pointed, the lower jaw very little longer than the upper. The small tongue is elongated oval; in the middle a little behind the apex appears a single series of very minute pointed teeth; on the palatals they are numerous but distant; the four to six on each side of the symphysis of the lower jaw are less minute; all are deciduous. The vertical diameter at occiput is $\frac{3}{4}$ of the length of the head; the greatest vertical diameter of the body, in front of the dorsal, is $\frac{1}{4}$ of the total length. The dorsal is placed at equal distance from the muzzle and the root of the caudal; the extent of the base is $2\frac{1}{2}$ in the length of the head; the upper mar-

* In the species here described a single series of 4 to 6 minute deciduous teeth appears on each side of the symphysis of the lower jaw.

gin is falcated ; the fourth and fifth, the longest rays, equal the extent of the base ; the last ray is elongated, $\frac{1}{2}$ of the fifth ray. The caudal is deeply cleft ; the length of the lobes slightly exceeds $\frac{1}{4}$ of the total length. The distance from the caudal to the anal equals the horizontal diameter of the eye ; the extent of the base of the anal is $\frac{2}{3}$ of the head ; the rays are $\frac{2}{3}$ of the diameter of the eye, but the last is a little elongated. The ventrals are placed opposite the middle of the dorsal, at equal distances from the root of the upper pectoral and the first anal ray ; their length is $2\frac{1}{2}$ in the head. The length of the pectorals is $\frac{3}{4}$ of the head. The scales are very deciduous, thin, and large, their circumference nearly equalling the eye. They have excessively fine vertical lines, and besides three larger distant ones, traversing the whole height of the scales ; parallel to the posterior margin appears an irregular series of minute oval holes. There are eleven series on each side, and about 45 scales between the gill-opening and the caudal. Single individuals occur at Pinang at all seasons, but great numbers during June, July and August. They are of delicate flavour and pass in the settlements of the Straits under the denomination of 'Sardines,' in imitation of which they are sometimes preserved in oil. A resemblance to *Alausa argyrochloris*, Cuv. et Val. (vol. XX. p. 440) is farther increased by the impossibility of perceiving the teeth either in fresh state or in specimens preserved in spirits of wine. They require the aid of a lens to be distinguished in the skeleton. The general form, the yellow dorsal fin with a small black spot give the present species a certain resemblance to *Meletta venenosa*, Cuv. et Val. (vol. XX. p. 377). Some specimens of *Clupeonia perforata*, procured by W. T. Lewis, Esq. Assist. Resid. Councillor, Pinang, were accompanied by the following account of a phænomenon witnessed by that gentleman during his official residence at Bencoolen. In 1822 great numbers of what was supposed to be this identical species, presented the unusual appearance of having red eyes. Many natives after having eaten these fishes, were suddenly attacked with violent vomiting, which in cases where remedies were not immediately applied, was known within an hour to terminate fatally. At the same time such of these fishes with the ordinary silvery eyes, were as formerly eaten with impunity. This phænomenon reoccurred at Bencoolen during the seasons of 1823 and 1825, but not of 1824. It was surmised that the poisonous fishes

had fed on a gelatinous substance which at that season exudes from the beautifully coloured coral reefs on that part of the coast of Sumatra. It is, however, more probable that the poisonous fishes were shoals of *Meletta venenosa*, an inhabitant of the Seychelles and the neighbouring seas, which happened in those seasons to visit Sumatra. M. Valenciennes describes this fish as being poisonous, and producing effects as noted above. In the Straits of Malacca *Clupeonia perforata* has never been known to produce bad effects.

Gen. Kowala, *Valenciennes*, 1847.

Minute teeth in the jaws and on the pterygoid bones; tongue, vomer and palatals* toothless.

Kowala thoracata, Cuv. and Val.

Russell, CLXXXVI. Kowal.
Clupea kowal, Rüppell: Neue Wirbelth. Fische, 79.?
Kowala thoracata, Cuv. and Val. XX. 363.

Head above and back deep blue with green reflections; upper third of the sides silvery sea-green; rest of the body, cheeks and opercles shining silvery with mother-of-pearl reflections; upper part of the opercle pale bluish dotted with black; dorsal and caudal pale yellow greenish, sparingly dotted with black, particularly towards the margin; in some individuals a vertical elongated blackish spot at the root of the five central rays; rest of the fins white. Tongue and inside of the mouth minutely dotted with black. Iris silvery, orbital margin black.

D 19, C $19\frac{6}{6}$, A 21 or 22, V 8, P 15, Br. VI.

Habit.—*Sea of Pinang.*

Coromandel, Red Sea.

Total length: $5\frac{4}{5}$ inch.

The length of the head is $\frac{1}{4}$ of the body, $\frac{1}{5}$ of the total length. The horizontal diameter of the eye slightly exceeds $\frac{1}{3}$ of the length of the head; the distance across the forehead is $\frac{2}{3}$ of the diameter. The eye is covered by a thick adipose duplicature with a vertically elliptic aperture over the circular pupil; it occupies the middle of the distance between the muzzle and the posterior margin of the opercle, and bor-

* Minute teeth, deciduous like the rest, appear on the palatals of the two species described.

ders on the profile. The figure of Russell represents the eye much too small, probably owing to the adipose fold having been overlooked. On the surface of each of the posterior frontal bones appear upwards of 11 backwards radiating lines. In the individuals examined at Pinang there appeared from six to eight teeth in the lower jaw, and some on the palatal and pterygoid bones, but none in the upper maxillaries, intermaxillaries, nor on the vomer. These teeth are so minute that they require to be seen through a lens in dried specimens, and they are so very deciduous that their number and position vary not only individually, but from side to side. The scales of the body are large, rounded, very thin and deciduous; those of the back and upper third of the sides have each upwards of 16 longitudinal striæ. The sides are covered by 11 longitudinal series of scales, of which there appear to be upwards of 45 in the longest series. There are 35 spines on the abdominal profile, the scales of which resemble in breadth those of the species of *Pellona*. The greatest vertical diameter of the body, in front of the dorsal, is a little less than $\frac{1}{4}$ of the total length. The dorsal occupies the middle of the distance between the muzzle and the root of the caudal; the fourth ray, the longest, equals the extent of the base, which is $\frac{1}{2}$ of the greatest vertical diameter of the body. The fin is half covered by an oblique backwards rising series of scales which almost hide the last rays. The caudal is deeply cleft, the lobes exceed by $\frac{1}{6}$ the length of the head. The scaly anal rays are very short; the last slightly elongated; the extent of the base is $\frac{2}{3}$ of the length of the head; its distance from the root of the caudal is $\frac{1}{2}$ of the extent. The ventrals are situated opposite the centre of the dorsal, exactly in the middle between the root of the first pectoral and anal rays; their length is $\frac{1}{3}$ of the head. The length of the pectorals is $\frac{2}{3}$ of the head. At Pinang single individuals are of rare occurrence.

Kowala lauta, Cantor.

Clupea kowal,* Temm. et Schlegel: Fauna Japon. Pisc. 235, Tab. CVII. Fig. 1.

Anterior half of the head above greenish grey dotted with black; posterior half and back intense glossy blue; upper half of the sides light golden green; rest of the body shining silvery with mother-of-

* *Clupea kowal*, Rüppell, vide *Kowala thoracata*, Cuv. and Val.

pearl reflections; behind the upper part of the opercle a rounded yellowish brown spot dotted with black, from which proceeds along the upper fourth of the side a yellowish brown band, terminating at the upper fourth of the root of the caudal; cheeks and opercles shining silvery with golden and sky-blue reflections; the temples minutely dotted with black; dorsal bright gamboge, anterior and upper margin blackish; caudal pale greenish yellow, upper and posterior margin blackish; rest of the fins white. Tongue and cavity of the mouth minutely dotted with black. Iris silvery, orbital margin blackish.

D 19, C 19$\frac{6}{6}$, A 16 or 18, V 8, P 15, Br. VI.

Habit.—*Sea of Pinang.*

Japan.

Total length: 6 inch.

In addition to the colours and the number of anal rays this species presents the following characters distinguishing it from *K. thoracata*. In the intermaxillaries and upper maxillaries appear single, widely spread, pointed teeth; in the lower jaw from 8 to 12 such very little larger; those on the palatal and pterygoid bones are more numerous, but also with irregular intervals, indicating that the teeth are deciduous. All are so minute that they cannot be seen in fresh specimens, and in dried ones but through a lens. The fifth dorsal ray, the longest, is less than $\frac{1}{2}$ of the greatest vertical diameter of the body, and equals the extent of the base of the fin; the last ray is a little elongated. The last anal ray is also a little elongated, and extends halfway to the root of the caudal. The ventrals are placed more forwards than in *K. thoracata;* the first ray commences opposite the second third of the dorsal, and its distance from the first anal ray exceeds by $\frac{1}{5}$ that from the root of the first pectoral ray. The sides are covered by 11 longitudinal series of scales, the longest series containing about 35 scales. The rest of the characters noted under *K. thoracata,* are precisely the same in the present species. Two individuals exactly similar, except in the number of anal rays, occurred together at Pinang in June 1844.

Gen. Alausa (Alosa, *Cuvier* 1817) *Valenciennes* 1847.

Small deciduous teeth in the jaws; all other parts of the mouth toothless.

Alausa toli, Cuv. and Val.

Alausa toli, Cuv. and Val. XX. 435.

Ikan trúboh or trúbu of the Malays.

Adult. Head above, back and upper third of the sides light greenish grey or lead-coloured; the scales strongly iridescent silvery; their margins dotted with black; rest of the sides, abdomen, cheeks and opercles strongly iridescent silvery; dorsal pale lead-coloured, in some individuals sparingly dotted with black; caudal scaly, pale silvery; upper lower and posterior margin minutely dotted with black; rest of the fins white. Iris mother-of-pearl, orbital margin blackish.

Or: head and body, instead of silvery, shining reddish yellow brass coloured; fins pale reddish yellow. Iris brass coloured.

Young. Like the adult, but with a more or less distant blackish spot behind the upper part of the gill-opening and an indistinct vertical blackish spot at the root of the five central rays of the caudal; upper half of dorsal closely dotted, so as to appear blackish.

D 18, C $19\frac{5}{5}$, A 19, V 8, P 15 or 16, Br. VI.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Borneo, Java, Sumatra, Pondicherry, River Cavery, Bombay.

Total length: 1 ft. 6 inch.

The length of the head is contained $4\frac{5}{6}$ times in the total; the diameter of the eye is $\frac{1}{6}$ of the length of the head; it occupies the upper third of the head; the distance from the muzzle is $\frac{1}{4}$ of the length of the head; the distance across the arched forehead is $1\frac{2}{3}$ diameter. The thick adipose fold covering the eye has a vertically elliptical aperture over the pupil. The first dorsal ray is excessively short and situated the length of one diameter of the eye behind the anterior third of the total length. The fourth and fifth are the longest, $2\frac{1}{3}$ in the greatest vertical diameter of the body, which is contained $3\frac{1}{2}$ to $2\frac{2}{3}$ times in the total length. The upper margin of the fin is falciform; the posterior ray a little elongated; the extent of the base is $\frac{1}{2}$ of the length of the head. The eleventh ray is exactly in the centre between the muzzle and the middle of the root of the caudal. The latter is deeply cleft; the lower lobe, a little longer than the upper, is a little less than the greatest vertical diameter of the body. The extent of the base of the anal slightly

exceeds that of the dorsal; the last ray is a little elongated; the first ray is situated at equal distance from the root of the caudal and the last ventral ray. The first ventral ray is situated in the centre between the muzzle and the root of the caudal, opposite the second fourth of the dorsal;* the length of the fin is $\frac{1}{3}$ of the caudal; that of the elongated, triangular scale $\frac{2}{3}$ of the longest ray. The pectorals extend nearly to the ventrals; their length is $\frac{3}{4}$ of the head; the elongated axillary scale is $\frac{1}{2}$ of the length of the fin. The sides are covered by 15 longitudinal series of scales, of which there are 39 or 40 between the gill-opening and the caudal. By these characters it may readily be distinguished from a closely allied species: *Alausa ilisha*, (Buchan. Ham.)† Small individuals are at Pinang very numerous during all seasons; larger ones less so, although by no means scarce. Like *A. ilisha* in Bengal, the present species is by the English of the Straits Settlements denominated: *Shad* or *Sablefish*, and is equally valued for its flavour. Both are, however, somewhat oily, very rich and bony. *Alausa toli* is remarkable as forming in the Indian Archipelago a distinct and important branch of fishery, principally for the sake of its roe. It is the kind of "*Shad*" to which Mr. Crawfurd refers as frequenting the great

* M. Valenciennes refers Russell No. CXCV. *Kelee*, to the young of the present species, but the ventral fins are placed very far backwards, opposite the posterior fourth of the base of the dorsal. If therefore the figure of Russell is correct, it represents a species different from *A. toli*.

† Syn.: Russell CXCVIII. *Palasah.*—*Clupanodon ilisha*, Buchan. Ham. 243, 382, Tab. XIX. Fig. 73 *(Young.)*—*Alosah palasah*, Cuv. R. A. II. 320 (1).—*Clupanodon ilisha*, Taylor: Gleanings of Science, II. 171.—*Alausa palasah*, Cuv. and Val. XX. 432.—*Alosa palasah*, Jerdon: Madras Journ. XV. 345. (Excl. Syn. *Clupea indica*, Gray).—The number of fin rays is: D 19, C $19\frac{5}{3}$, A 19, V 8, P 14, 15 or 16, Br. VI. It has 19 longitudinal series of scales, of which there are 47 to 49 between the gill-opening and the caudal. Buchanan Hamilton gives: D 20, A 21, probably owing to his having counted the last double rays as single. Sir John Richardson quotes, not without doubt, a specimen in the British Museum as *Alosa palasah*, Russell 198? (Report 1845, 306). Forty scales form a longitudinal row, and there are fifteen rows in height; "the pectorals reach nearly to the ventrals, which are attached before the middle of the dorsal." These characters are sufficient to prove the species to be distinct from Russell's *Palasah*, while they agree with *Alausa toli*, Cuv. and Val. But Sir J. Richardson counts: D 16, A 18, P 15, V 9.

river Siak in Sumatra, and of which the dried roe, of enormous size, constitutes an article of commerce. (Crawfurd: *Hist. Ind. Archipel.* III. 440.—Royle: *On the Production of Isinglass*, 76). A description of the fishing of this species is given by the late Mr. Moor in *Notices of the Indian Archipelago*, &c. p. 29. "At Bukit Batu,* a place on the main of Sumatra within the Strait formed by the island of Bankalis, exists an extensive fishery well known in this part of the world. The fish which is the object of it is called in the Malayan language: *Trúbu.* The fish itself is sufficiently known in all the neighbouring seas but found with a roe only here,† which makes it certain that it repairs to this favoured place for the purpose of spawning. The *Trúbu*, about a cubit long, is taken in 3 and 4 fathoms water on a mud bank. About 300 boats are engaged at all seasons in the fishery with the exception of four days during dead neap tides. The roes are an article of trade seaways, and the dried fishes are sent into the interior of Sumatra. The Rajah of Siak draws a revenue from this fishery of 72,000 guilders yearly, receiving a certain duty upon the quantity taken. From the rate and amount of this duty it is ascertained that the quantity of fish caught yearly amounts to between fourteen and fifteen millions. It seems a little remarkable that the spirit of European monopoly never should have fastened upon so promising an object of gain. The fishery, from its peculiar nature, is probably quite inexhaustible, and might unquestionably be prodigiously improved by European skill and industry, and this too not only without detriment, but probably to the great improvement of the revenue of the native prince, as well as the essential benefit of the surrounding population." In the Malayan markets the roe is called "*Télur íkan*," the fish-roe "par excellence." Like the preparation of fermented fish and shell-fish: "*Balachan*," it is largely used by the Malays and Chinese to season and make their food palatable and it is no less a favourite relish with Europeans. W. T. Lewis, Esq. Resident Counsellor, Pinang, who has observed the process of preparation in Sumatra, describes it as follows. The fresh roe is thoroughly salted, and next partially dried, so as to retain a slight moisture, in which state it is by hundreds closely

* Opposite to, and a little to the southward of Malacca.

† That is to say, in shoals, for it is plentiful at Pinang, Malacca and Singapore.

placed in casks, and thus exported. In our Malayan Settlements the price is from 3 to 4 Spanish Dollars per hundred. The dealers there export considerable quantities to China, after having taken the precaution to repack the roes between layers of salt, and to sprinkle them with arrack. To dress them, they are soaked for about half an hour in water, and then fried. As the roe appears in commerce, it is of an elongated flat shape, measuring from 6 to 8 inches in length, about 2 in breadth, and $\frac{3}{4}$ of an inch in depth, of a deep amber colour. The single eggs are larger than those of *A. ilisha*.

Alausa champil, (Cuv. and Val.)

(*Icon.*) Clupea champil, Gray: Ill. Ind. Zool. II. Pl. 91, Fig. 5 and 6.
Pellona champil, Cuv. and Val. XX. 324.

Head above, back and upper third of the side pale sea-green, sparingly dotted with black; rest of the body and head silvery with lilac reflections; from behind the upper part of the opercle to the caudal a pale longitudinal lilac band, the upper margin of which pale silvery; dorsal, anal and caudal yellowish white, the two first with a black dot at the root of each ray; caudal minutely dotted with black; rest of the fins hyaline. Iris silvery with lilac reflections.

D 16, C $19\frac{6}{6}$, A 18, V 7, P 11, Br. VI.

Habit.—*Sea of Pinang.*

Total length: $3\frac{1}{8}$ inch.

The length of the head is $\frac{1}{5}$ of the total; the horizontal diameter of the orbit is a little less than $\frac{1}{3}$ of the length of the head; the distance across the forehead equals the diameter. The jaws are nearly equal; the length of the upper slightly exceeds the diameter of the eye. There are no teeth in any part of the mouth. The greatest vertical diameter of the body, in front of the dorsal fin, is contained $3\frac{2}{3}$ times in the total length. The sides are covered by 11 longitudinal series of scales, of which there are about 42 between the gill-opening and the caudal. The abdominal line carries 29 fine species. The dorsal commences a little in front of the centre between the muzzle and the root of the caudal; the fifth, the longest ray, is $\frac{2}{3}$ of the length of the head and equal to the extent of the base. The upper margin is straight; the last ray a little elongated. The caudal lobes are equal, $\frac{1}{4}$ of the total length. The anal commences a little in front of the posterior fourth

of the distance between the muzzle and the root of the caudal; the length of the longest rays, the 4th, and 5th, is $\frac{1}{2}$ of the 5th dorsal; the extent of the base slightly exceeds that of the dorsal. The first ventral ray is situated opposite the first dorsal ray, a little nearer the first pectoral than the first anal ray; the length of the fin is $\frac{1}{2}$ of that of the head. The length of the pectorals is $\frac{3}{4}$ of the head. Two individuals of equal length occurred together at Pinang in October 1843. Both strikingly resemble a drawing of Buchanan Hamilton's duplicate series, marked in Buchanan's hand writing: "*Clupea champil, B.*" This drawing is evidently the original of the indifferent copy in the *Illustr. of Indian Zool.*, which is the foundation of *Pellona champil*, Cuv. and Val. It is one of the few drawings which Buchanan has omitted to describe in his work upon the fishes of the Ganges.

Gen. Engraulis, (*Cuvier* 1817) *Valenciennes* 1848.

Mouth cleft far behind the eyes; muzzle projecting, pointed; ethmoid bone advancing in front of the jaws; intermaxillaries soldered to the maxillaries, hid beneath the muzzle; vomer narrow with a few teeth on the anterior part; palatals and pterygoids narrow, bristling with minute teeth, or rough; gill-opening very large; body rounded or compressed like a knife-blade; abdomen trenchant or toothed.

Engraulis brownii, (Gmelin).

"Menidia, corpore subpellucido," Brown: Jamaica 141, Tab. XLV. Fig. 3.

Argentina, Gronov. Zoophyl. 112, No. 350.
Atherina japonica, Houttuyn: Act. Haarl. XX. 340 ?
Atherina brownii, Linné: Syst. 1397.
Atherina australis, White: Voyage, 196, Fig. 1.
Atherina (Clupea) brownii, Bloch-Schneider.
Stolephore commersonien, Lacép. V. 382, Tab. XII. Fig. 1.
Clupea vittargentea, Lacép. V. 424, 458, 461, (*Excl. Syn.*)
Russel CLXXXVII. Nattoo.
Atherina menidia, Shaw V. 131.
Commersonian Atherine, ibid, Pl. 113, Fig. 1.
Atherina japonica, Shaw V. 132 ?

Engraulis (Stolephore commersonien), Cuv. R. A. II. (1817,) 175. (').
(1829,) 323. (').

Engraulis albus, Swainson II. 293.

Engraulis commersonianus, Richardson : Report 1845, 308.

'Descript. of anim. 201, Fig. 149' ? ibid, 305, 309.

Engraulis fasciata, Cuv. and Val. XXII. 43.

Engraulis brownii, Cuv. and Val. ibid, 41.

Engraulis commersonii, Bleeker: Verh. Batav. Gen. XXII. 6.

Búnga ayer, or Bádah of the Malays.

Head above light greenish grey, a large oval blackish spot occupying the posterior half; back pale sea-green or greenish grey ; sides and abdomen transparent greenish buff, or grey with reflections of mother-of-pearl ; from the upper third of the gill-opening to the root of the caudal a broad longitudinal silvery band ; cheeks and opercles shining silvery, the latter above dotted with black ; caudal pale yellow, dotted with black, rendering the posterior margin blackish ; rest of the fins hyaline. Iris silvery, orbital margin blackish.

D 14, 15 or 16, C 19$\frac{3}{3}$, A 20 or 21, V 7, P 15 or 16, Br. XI.

Habit.—*Sea and estuaries of Malayan Peninsula and Islands.*
China sea, New Zealand, Madura, Java, Sumatra, Bombay, Coromandel, Bay of Bengal, Gangetic estuaries, Isle of France, Australia, New York, Havanah, Jamaica, Vera Cruz, Martinique, Barbadoes, St. Christopher, Rio Janeiro.

Total length : 6 inch.

The head is $\frac{1}{5}$ of the total length ; the horizontal diameter of the eye is contained $3\frac{1}{2}$ times in the length of the head ; the distance across the forehead equals one diameter ; the greatest vertical diameter, in front of the dorsal, is $\frac{1}{5}$ less than the length of the head. The body is covered by 7 longitudinal series of deciduous scales, of which there are from 35 to 38 on the third series. On the anterior twelve scales of this series appears the lateral line which consists of a linear central tube, which disappears or becomes indistinct on the rest of the scales. The latter are diaphanous, rhomboidal, with their horizontal diameter $\frac{1}{2}$ of the vertical. The dorsal commences nearly in the middle between the muzzle and the centre of the posterior margin of the caudal ; the anal commences opposite the posterior third of the dorsal. The ventrals are situated in the middle

between the pectorals and the anal. The caudal is deeply cleft; the length of each lobe equals that of the head. In the Straits of Malacca as in the mouths of the Ganges, this species is astoundingly numerous at all seasons. Two to three inches is the usual length, five to six are very rarely seen. In fine weather swarms may be seen swimming near the water's edge, and making very short leaps closely above the surface of the sea. As Russell observes, they are highly valued for their delicate flavour when fried. In Java, Sumatra and the Straits of Malacca, large quantities are preserved both for home consumption and exportation to China and India. The delicious condiment is famed under the denomination of "*Red-fish*," (*Ikan mérah* of the Malays,) or "*Malacca-fish*," and is used as a relish. The following mode of preparation, as practised at Bencoolen and Malacca, has been communicated by W. T. Lewis, Esq. Asst. Res. Counsellor, Pinang. After the heads have been removed, the fishes (those of middling size are preferred), are cleansed, salted (in the proportion of one to eight parts of fish), and deposited in flat glazed earthen vessels. In the latter they are for three days submitted to pressure by means of stones placed on thin boards or dried plantain leaves. The fishes are next freed from salt and saturated with vinegar of Cocoa Palm toddy, after which are added powdered ginger and black pepper (the latter mostly entire), and some brandy and powdered "Red rice." After having been kept for three days, a little more vinegar is added before placing the fishes in well closed jars or bottles. They should be kept four or five months before being used. The expense of a quart bottle of the condiment is about 30 Cents, the selling price one Spanish Dollar. "Red rice" is the variety of *Oryza sativa* called *glutinosa* (*púlut*, or *bras sepúlut* of the Malays) steeped in an infusion of Cochineal. In the Straits Settlements red rice is imported from China, and sells at the rate of 10 Cents of a Dollar per ℔. The Chinese settlers in the Straits prepare a similar red condiment with slices of *Polynemus indicus* and *P. tetradactylus* and also prawns.

(Setipinna, *Swainson*, 1839.—Telara, *Val.* 1848.—*Anterior pectoral ray elongated, filamentous*).

Engraulis breviceps, Cantor.

Head and body reddish golden or brass colour, back sparingly dotted with black; fins reddish yellow, like the body, but not metallic; anterior half of upper dorsal margin, and the posterior caudal margin broadly brimmed with black; posterior fifth of the aual margin equally so. Iris reddish golden.

D 1/16, C $19\frac{3}{3}$, A 63, V 7, P 13, Br. XVI—XVI.

Habit.—*Sea of Pinang.*

Total length: $9\frac{4}{8}$ inch.

The head is strikingly short; the distance from the muzzle to the upper part of the posterior margin of the opercle is contained $8\frac{2}{3}$ times in the total, (measured to the occiput, it is $\frac{1}{13}$ of the total.) The horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the distance across the forehead is a little less than two diameters. The greatest vertical diameter of the body, in front of the dorsal, is $\frac{1}{4}$ of the total length. The dorsal commences in the centre between the muzzle and the root of the caudal; the first soft ray is preceded by a short strong spine. The anal commences in front of the dorsal, opposite the second third of the total; the extent of the base of the anal is $2\frac{1}{5}$ in the total. The upper caudal lobe is truncated. The ventrals are situated in the centre between the first ray of the pectorals and the anal. The first pectoral ray is a little less than $2\frac{2}{3}$ times in the total length; it does not reach the middle of the anal. The second pectoral ray slightly exceeds $\frac{1}{4}$ of the first. This species nearest approaches *E. telara*, (Buchan. Hamilton). A single individual was observed at Pinang in August 1844.

Engraulis taty, Cuv. and Val.

Engraulis taty, Cuv. and Val. XXI. 60.

Head above and back greyish green or greenish slate colour, sparingly dotted with black; sides above the lateral line pale silvery green; the rest, abdomen, cheeks and opercles silvery; dorsal, caudal and anal yellow; ventrals and pectorals hyaline; in some the posterior caudal margin blackish. Iris silvery, orbital half bluish black.

D 1/14, C $19\frac{3}{3}$, A 52 to 56, V 7, P 16, Br. XIII—XIII.

Habit.—*Sea of Pinang, Malayan Peninsula.*
Malabar, Pondicherry.

Total length: 6 inch.

Measured to the upper part of the posterior margin of the opercle, the length of the head is contained $6\frac{2}{3}$ times in the total, (to the occiput it is $9\frac{2}{3}$ in the total.) The horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the distance across the forehead is $1\frac{1}{2}$ diameter. The greatest vertical diameter of the body, in front of the dorsal, is $4\frac{1}{3}$ in the total length. The dorsal commences a little in front of the middle between the muzzle and the root of the caudal. The anal commences opposite the centre of the dorsal; the extent of the base is $2\frac{2}{3}$ in the total length. The ventrals are situated in the centre between the first pectoral and the fifth anal ray. The upper caudal lobe is truncated. The first pectoral ray is $1\frac{4}{5}$ in the total length: it reaches to the posterior third of the anal; the second pectoral ray is $3\frac{1}{2}$ in the length of the first. Single individuals occur at Pinang at all seasons, and are eaten either fresh or dried by the natives.

(Thrissa, *Rafin.* 1815.—*Maxillaries greatly elongated.*)

Engraulis mystax, (Bloch-Schneider).

Clupea mystax, Bl. Schn. 426, No. 14, Pl. 83.

Thryssa mystax, Cuv. R. A. II. 323 ([3]).

Thryssa mystax, Richardson: Report, 1845, 309 (*Excl. Syn. Clupea malabarica and Poorawah, Russell,* 189?)

Engraulis mystax, Cuv. and Val. XXI. 67.

Head above and back dark bluish green; lighter silvery on the sides above the lateral line; behind the upper part of the gill-opening a triangular spot, composed of horizontal, black, dotted lines, downwards increasing in length; rest of the sides and abdomen silvery white; cheeks and opercle silvery with golden reflections; dorsal and caudal whitish yellow, marginal half minutely dotted with black; rest of the fins whitish transparent. Iris silvery, orbital margin bluish black.

D 1/13, C $19\frac{3}{4}$, A 37, 38 or 39, V 7, P 14, Br. XII.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Bombay, Malabar, Coromandel, Gangetic estuaries.

Total length: 8 inch.

The length of the head is $\frac{1}{5}$ of the total. The horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the distance across the forehead is $1\frac{1}{2}$ diameter. The greatest vertical diameter, in front of the dorsal, is $\frac{1}{4}$ of the total length. The upper jaw extends beyond the root of the pectorals. The dorsal commences a little behind the centre of the distauce between the muzzle and the root of the caudal fin. The caudal lobes are equal, pointed, and as long as the head. The anal commences opposite the posterior third of the dorsal; the extent of its base is contained about $3\frac{1}{2}$ times in the total length. The ventrals commence nearer the pectorals than the anal, their distance from the symphysis of the lower jaw is $2\frac{3}{4}$ in the total length. The pectorals are $\frac{1}{4}$ shorter than the head; placed in contact with the sides, their apex extends to the last ray of the ventrals. At Pinang single individuals occur at all seasons and are eaten by the natives. Sir John Richardson considers *Clupea malabarica*, Bloch. (Pl. 432.—Bl. Schn. p. 425) and *Poorawah*, Russell, CLXXXIX, to be identical with the present species. But according to the description of *Engraulis malabarica*, (Cuv. and Val. XXI. 63, Pl. 609) the upper jaw extends very little beyond the margin of the opercle, and does not extend as far as the pectorals, and the latter barely touch the root of the ventrals. The figure of *Poorawah* is scarcely correct enough, nor the description (Russell, p. 72,) sufficiently explicit to determine the species.

Dr. Bleeker has described a new species under the inadmissible name of *Thryssa porava*, which he with doubt refers to *Poorawah*, Russell, CLXXXIX. (Bleeker: *Bijdrage tot Ichth. Fauna van Madura*, in: *Verh. Batav. Genoots.* XXII. p. 14.)

ENGRAULIS PURAVA, (Buchan. Hamilton).

Russell CXC. Peddah Poorawah.

Clupea purava, Buchan. Hamilt. 238, 382.

Thrissa (Pedda Poorawah) Cuv. R. A. II. 323 (3).

Thrissa megastoma, Swainson, II. 293.

Engraulis purawa, Cuv. and Val. XXI. 65.

Head above and back dark bluish greeu; lighter silvery above the lateral line; rest of the sides, abdomen, cheeks and opercles silvery; fins coloured like those of *E. mystax*. Iris silvery; orbital margin bluish black.

D 1/13, C $19\frac{3}{3}$, A 43, 45 or 46, V 7, P 14, Br. XII.

Habit.—*Sea of Pinang.*

Coromandel, Gangetic estuaries, Java, Madura.

Total length: 8 inch.

The length of the head is $\frac{1}{6}$ of the total. The horizontal diameter of the eye is contained $4\frac{1}{2}$ times in the length of the head, the distance across the forehead is $1\frac{1}{2}$ diameter. The greatest vertical diameter, in front of the dorsal slightly exceeds $\frac{1}{4}$ of the total length. The maxillaries are narrower and longer than in *E. hamiltoni*, where they reach to the root of the first pectoral ray; in the present species they reach to the root of the posterior pectoral ray. The dorsal commences a little in front of the centre between the muzzle and the root of the caudal; the anal commences in the centre of that space, opposite the middle of the dorsal. The extent of the base of the anal is $\frac{1}{3}$ of the total length. The caudal lobes are equal, pointed, and as long as the head. The pectorals are a little shorter. The ventrals are situated a little nearer the pectorals than the anal. At Pinang this species appears to be of uncommon occurrence.

Gen. Coilia, (*Gray*, 1831.*) *Cuv. and Val.* 1848.

(Trichosoma, Trichosomus, *Swainson*, 1839.—Chœtomus, *McClelland*, 1843.)

Gape wide; gill-opening very open; muzzle projecting, supported by the ethmoid bone; upper maxillaries free, projecting beyond the opercle, and in some species reaching the root of pectorals; dorsal placed on the anterior part of the back; body elongated, compressed, tapering to a pointed tail; anal joining the caudal, elongated, low, but in one species tail shortened and caudal widened, rounded; above the pectoral two groups of filaments, parting from a common base; in general characters like *Engraulis (Thrissa)*, but the anterior pharyngeals are more distinctly, though minutely, toothed.

* *Zool. Misc.* 9.—Mr. Gray's characters are: "Body tapering, compressed; dorsal fin short, over the ventrals; anal and caudal fin united; pectoral fins small; rays five; three upper long and free; rest of the characters like *Thrissa*."

Coilia reynaldi. Cuv. and Val

Coilia reynaldi, Cuv. and Val. XXI. 81. *(Young.)*

Adult. Pale golden throughout; head above and back sparingly dotted with black; from the middle of the gill-opening towards the tail a series of distant rounded spots of shining or burnished gold; in some individuals a second shorter series from the root of the pectorals to opposite the anterior third of the anal; fins reddish yellow; upper half of dorsal sparingly dotted with black, caudal and margin of the anal blackish. Iris golden, orbital half black; pupil circular, but the aperture of the adipose orbital membrane horizontally elliptic.

D 1/15, C 11, A 107 to 116, V 7, P $\frac{IV}{11}$, Br. X.

Habit.—*Sea and estuaries of Pinang, Malayan Peninsula, Singapore.*

Rangoon.

Total length: 7 inch.

The length of the head is $\frac{1}{6}$ of the body, the caudal not included, or $6\frac{1}{2}$ in the total. The horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the distance across the forehead is $1\frac{1}{2}$ diameter. The upper maxillaries reach but halfway between the angle of the lower jaw and the root of the pectorals. The greatest vertical diameter, in front of the dorsal, is contained from $5\frac{1}{2}$ to $5\frac{2}{3}$ times in the total length. The dorsal, preceded by a short, strong spine, commences a little in front of the second fourth of the total length; the first divided ray (the fifth of the fin,) terminates in a filament, which, however, from its slenderness is frequently broken. The ventrals are situated opposite the commencement of the dorsal, a little nearer the pectorals than the anal. The latter commences a little behind the dorsal, at the second third of the total length. The extent of the base of the anal is $1\frac{3}{4}$ in the total length, in which the distance from the muzzle is $2\frac{2}{3}$. The four pectoral filaments are contained $3\frac{1}{2}$ times in the total length and reach a little behind the commencement of the anal; the second ray is divided in two, the other three are simple. The length of the pectoral rays does not exceed $\frac{2}{3}$ of the head. The caudal is pointed. At Pinang single individuals occur at all seasons, and like the rest of the *Clupeoidæ*, are eaten by the natives either fresh or dried.

Gen. Chatoessus, *Cuvier*, 1829.

Mouth small, without teeth; muzzle projecting; on the upper jaw a notch and a corresponding tubercle on the lower; the superior combs of first branchial arches unite with those of the opposite side, forming a pennated point under the palate; body short, deep, oval; in some species the posterior dorsal ray elongated.

Chatoessus chacunda, (Buchan. Ham.)

Clupanodon chacunda, Buchan. Ham., 246, 383.

Chatoessus chacunda, Cuv. and Val. XXI. 111.

Head above and back sea-green, minutely dotted with black; sides and abdomen silvery or pale golden; the centre of the scales of the upper third of the sides minutely dotted with black, forming five very pale blackish longitudinal lines; behind the upper part of the opercle a large black spot; cheeks and opercles golden; caudal yellow, sparingly dotted with black; rest of the fins hyaline whitish; dorsal dotted with black. Iris golden dotted with black.

D 19, C $19\frac{4}{4}$, A 20, V 7, P 15, Br. VI.

Habit.—*Sea of Pinang, Malayan Peninsula.*

Moluccas, Java, Malabar, Gangetic estuaries.

Total length: 6 inch.

The length of the head is contained $4\frac{2}{3}$ times in the total. The horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the distance across the forehead slightly exceeds one diameter. The greatest vertical diameter, in front of the dorsal, is $2\frac{2}{3}$ in the total length. The body is covered by 13 longitudinal series of scales, the horizontal diameter of which is about $\frac{1}{3}$ of the vertical. A series between the gill-opening and the caudal contains from 36 to 39 scales. The dorsal occupies the last of the anterior half of the total length; the fourth ray, the longest, equals the extent of the base, which is $\frac{2}{3}$ of the head; the last ray is $\frac{1}{2}$ of the fourth. The caudal is deeply cleft; the posterior margin of each lobe is arched; the length is $3\frac{3}{4}$ in the total. The first ray of the anal is placed at equal distance from the first ventral and the root of the caudal; the fin is very low; its extent equals that of the dorsal. The ventrals are placed opposite the middle of the dorsal. The pectorals are $\frac{3}{4}$ of the length of the head. Single individuals occur, but rarely, at Pinang.

SUBORDO PHYSOSTOMI APODES.

FAM. MURÆNOIDÆ.

GEN. CONGER. *Cuvier*, 1817.

(MURÆNESOX, *McClelland*, 1843.*)

The dorsal commences very near, or even above the pectorals; in all species known the upper jaw is the longer.

CONGER TALABON, Cuvier.

Russel, XXXVIII. Tala Bon.

Conger (Muræna) talabon, Cuv. R. A. 350. (4).

Muræenesox lanceolata, McClelland, Calc. Journ. Nat. Hist. IV. 409.

Muræenesox exodon, McClelland, ibid.

Muræenesox serradentata, (Russell, XXXVIII.) McClelland, ibid.

Muræenesox exodentata, McClelland, Calc. Journ. Nat. Hist. V. 180, Pl. VIII. Fig. 4, and page 210, "*Pl. VI. Fig.* 3" *(erroneous reference)*.

Muræenesox lanceolata, McClelland, ibid, 181 "*Pl. VI. Fig.* 3" *(erroneous reference)* and page 210, "*Pl. VI. Fig.* 3" *(erroneous reference)*.

Muræenesox serradentata, McClelland, ibid. 210.

Conger talabon, Bleeker: Verh. Batav. Gen. XXII. 6.

Head above, back and sides above the lateral line golden greenish- or brownish-olive, minutely dotted with black; upper lip, cheeks, opercles and lower half of the sides lighter golden olive; under lip, throat and abdomen milk-white; dorsal, caudal and posterior half of anal pale olive, transparent, minutely dotted and edged with black; anterior half of anal transparent white; pectorals transparent yellowish. Iris golden.

Young individuals, frequenting estuaries, are of darker, less golden colours.

* "*Absence of tubular nostrils*" is given as a character distinguishing *Muræenesox* from *Conger*. The character, however, is incorrect, as in all the supposed species of Mr. McClelland the anterior apertures of the nostrils are provided with a tube, which is very distinct in the living fish.

D 238 to 286,
C 9 to 11,
A 151 to 129,
398 to 426
} P 16, Br. XV.

Habit.—*Sea and estuaries of Malayan Peninsula and Islands.* Coromandel, Tenasserim, Coast of Arracan, Bay of Bengal, estuaries of the Ganges, Sumatra, Java, Madura.

Total length: 7 ft. 5 inch.

The general form of the body is cylindrical, the anterior half slightly compressed, the posterior more so and tapering; the head is elongated conical, terminating in a narrow rounded muzzle near which in the upper jaw appears a wide notch, which receives the long conical teeth near the symphysis of the lower jaw. The length of the head, measured to the gill-opening, is $\frac{1}{6}$ of the body, not including the caudal, which latter varies from $\frac{1}{5}$ to $\frac{1}{7}$ of the length of the head. The distance from the muzzle to the anterior margin of the orbit varies from $3\frac{1}{2}$ times in to $\frac{1}{4}$ of the length of the head. The distance across the notch of the upper jaw is $\frac{1}{2}$ of the horizontal diameter of the orbit; between the anterior margins of the orbit it is $\frac{3}{4}$, between the posterior margins, it equals the horizontal diameter of the orbit. The latter is $\frac{1}{3}$, or a little less than $\frac{1}{3}$ of the distance from the muzzle to the anterior margin of the orbit.* The latter margin is situated in front of the centre of the distance between the muzzle and the angle of the mouth, which distance is a little less than $\frac{1}{2}$ of the length of the head to the gill-opening. The anterior aperture of the nostrils is oval, provided with a short, yet very distinct tube; it is situated immediately above the lip, at the termination of the notch, a little in front of the centre between the muzzle and the anterior margin of the orbit. The posterior aperture is linear, or more elongated oval than the anterior, with the margin slightly raised, but not tubular; it opens a little in front of the eye at a distance from the anterior aperture equal to that of the latter from the muzzle. On each side of the crown of the head, a little farther

* In the larger, upper figure of the head in *Calc. Journ. of Nat. Hist.* V. Pl. VIII. Fig. 4, the eye is represented too small, and is placed too far back; in the smaller figure the eye is correctly placed, but the gill-opening is much too near the angle of the mouth. These disproportions materially affect the position of the dorsal and pectoral fins in the figure.

back than the angle of the mouth, appears a transversal series of 8 to 10 pores; from the middle of each series proceeds forwards another shorter, longitudinal one, consisting of 3 to 5 pores. The distance from the muzzle to the angle of the mouth is one longitudinal diameter of the eye less than one half of the length of the head. The lips are thin, membranous, and closely adhering to the jaws. In the upper jaw appear three very close series of small conical teeth with the apex compressed and trenchant. The external series is excessively minute, and extends from the angle of the mouth to beneath the middle of the eye; the teeth of the second are about double the size of the former, with which they are in close contact, but they extend farther forwards to between the nasal apertures, where they coalesce with the external series of the teeth of the vomer; the third, internal, series consists of excessively minute conical teeth, distant among themselves and a little removed from the second series; they extend as far as the external series. Immediately in front of the notch the muzzle forms a small round space, the margin of which is armed with 4, 5, or 6 distant conical teeth, which are about $\frac{1}{3}$ of the diameter of the eye. From the middle of the muzzle commences a short single series of 6 or 7 small conical teeth; which, as they continue along the middle of the vomer, become distant, much longer, compressed towards the apex and with trenchant margins. The number of these teeth varies with age from 7 to 15, of which the longest are about $\frac{1}{2}$ of the diameter of the eye. In young individuals the two or three posterior ones are much compressed and tricuspidate. From the first long tooth commences a single close series of teeth which continue on each side of the vomer, but join each other a little behind the central series, which terminates between the eyes. The marginal teeth of the vomer are a little larger than the middle series of the jaw which they resemble in form. The lower jaw is much shorter than the upper: the symphysis is widened into a small rounded disk, on each side of which appear two or three long, distant, conical teeth, situated within the external series. The latter consists of much smaller outwards directed, distant, conical teeth, which beneath the eye decrease and become much closer. The middle series, headed by the longer ones behind the symphysis, consists of close, erect, conical teeth, with compressed trenchant apex. From beneath the eye the interval between the external and middle

series is filled by a short series of minute conical teeth. The third internal series is also minute, and extends from the angle of the mouth to a little in front of the posterior half of the jaw. The tongue is small, elongated, and tied to the floor of the mouth; it extends to a little in front of the posterior third of the mouth. The vertical diameter at the occiput equals the distance from the muzzle to the posterior nasal aperture, or it is contained from $4\frac{1}{2}$ to 5 times in the distance from the muzzle to the gill-opening. The greatest vertical diameter of the body is $\frac{1}{3}$ of the distance from the muzzle to the gill-opening; the smallest, in front of the caudal, is $\frac{1}{4}$ of the latter. The lateral line commences from the side of the occiput, gently declining towards the end of the anterior fourth of the body, from whence it continues a little above the middle of the side straight to the caudal. It is composed of a series of tubes placed in pairs one above the other, none exceeding in length $\frac{1}{2}$ the diameter of the eye. Each lower tube sends two branches obliquely downwards, and between these branches appears a pore. The dorsal commences a little in front of the gill-opening, at a distance from the base of the upper pectoral ray of $\frac{1}{5}$ of the length of that fin. The dorsal and anal rays are undivided. All the fins present the peculiarity of having double rays; they appear to be single, but are composed of two distinct ones placed transversely, and kept by the fin-membrane so closely in contact, that each pair can act like a single ray. The caudal is closely united with the dorsal and anal, from both of which it may be distinguished by its much slenderer, branched, rays; their length either equals or slightly exceeds that of the dorsal rays. The anus is situated in front of the middle, either at, or a little behind the end of the fifth-twelfth of the total length. The anal fin commences immediately behind the vent; the rays are $\frac{2}{3}$ of those of the dorsal. The pectorals are elongated, with branched rays; their length equals the distance from the muzzle to the posterior margin of the orbit. The skin is smooth and naked.

The description and figure of Russell are sufficient, easily to identify the species, which Mr. McClelland has renamed *Muræsox serradentata* and described as having serrated teeth on the vomer. This error would appear to originate in a singular misinterpretation. Russell describes the jaws: "in both there are long crooked teeth in front, with a regular row of straight teeth in the upper jaw, *which is* rough on both sides like a file." Russell could not have chosen a more

correct simile of the roughness of the upper jaw of the young individual he had before him, but he says nothing of the teeth being serrated. *Muræsox exodentata*, McClelland, differs in no one character from *serradentata*, but the description is inaccurate as far as concerns the dentition, the anterior aperture of the nostrils, and the lateral line. Nor is *Muræsox lanceolata*, McClelland, different from either of the preceding, but the dentition and anterior nasal apertures are incorrectly described.

Conger talabon is in the Straits of Malacca, numerous at all seasons, but individuals exceeding 3 to 4 feet are less common. The Malayan denominations of *íkan úlar*, (i. e. fish-snake,) and *málang* are indiscriminately applied to eels, all kinds of which are eaten by the natives. The heart is situated immediately behind the gill-openings. The œsophagus extends as far behind the latter as the distance from the muzzle to the angle of the mouth. The stomach is a narrow cylinder about $\frac{1}{5}$ of the total length, extending to the anus; the coats are thick and firm, with longitudinal folds on the internal surface. The intestine is a simple cylindrical canal, thinner than the stomach; the posterior part is a little tortuous, which makes it a little longer than the stomach. The liver is bilobate, very short, of a brownish yellow colour; it commences from the apex of the heart, and adhering to œsophagus, it terminates at the origin of duodenum, where the short, straight cystic duct enters. The gall-bladder is small, oval, of a greenish white colour. The spleen is short, linear, adhering to duodenum, of a pale crimson colour. The air-vessel is elongated, spindle-shaped, not exceeding the diameter of the stomach; it commences above the cardia, follows the stomach, but extends behind the anus in a cavity in the tail; the length is about $\frac{1}{3}$ of the total; the coats are very thin, transparent silvery white.

Conger bagio, (Buchanan Hamilton.)

Muræna bagio, Buchan. Ham. 24, 364.

Conger longirostris, Bennett: Life of Raffles, 692.

Muræsox tricuspidata, McClelland: Calc. Journ. N. H. IV. 409, Pl. XXIV. Fig. 1, a. b.

Muræsox hamiltonii, (M. bagio,) McClelland: Calc. Journ. N. H. V. 182, Pl. VIII. Fig. 3, and page 210.

Murænesox bengalensis, McClelland, ibid. 182.

Congrus tricuspidatus, Richardson: Ichth. of Sulph. 105, Pl. 51, Fig. 2.

Congrus tricuspidatus, Richardson, Report, 1845, 312.

Conger hamo, Temminck et Schlegel: Fauna Japon. Pisc. 262, Pl. CXIV. Fig. 2.

Colours exactly like those of *C. talabon*.

D 238 to 245,
C 9 to 11, } P 15 to 18, Br. XX.
A 198 to 211,
445 to 467.

Habit.—*Sea and estuaries of Malayan Peninsula and Islands.* Japan, Chusan, Ningpo, Canton, Coromandel, Bay of Bengal, Tenasserim, Gangetic estuaries.

Total length: 5 ft.

The general form resembles that of *C. talabon*, but it is less slender, the muzzle less elongated, the eye larger, the teeth of the vomer and some of those of the lower jaw are tricuspidate; the dorsal and anal extend farther forwards; the pectorals and caudal are shorter, and the branchiostegous rays more numerous. The length of the head, from the muzzle to the gill-opening, is contained from $6\frac{1}{2}$ to $6\frac{1}{3}$ times in the total length. The distance from the muzzle to the anterior orbital margin is $\frac{1}{4}$ of the length of the head. The distance across the notch of the upper jaw equals the horizontal diameter of the eye, which is $\frac{1}{2}$ of the length of the muzzle; the distance between the anterior margins of the orbits is $1\frac{1}{2}$, between the posterior margins it is two diameters. The eye occupies the third-eighth of the head; the anterior margin of the orbit is situated at the posterior third of the distance from the muzzle to the angle of the mouth; the length of the mouth is contained $2\frac{1}{2}$ to $2\frac{1}{3}$ times in that of the head. The anterior, tubular, aperture of the nostril opens at the end of the anterior third of the distance between the muzzle and the eye; the posterior occupies the commencement of the posterior third of that distance. The pores of the crown of the head are very indistinct. The general distribution of the teeth resembles that of *C. talabon*, but the teeth themselves present the following differences. Those of the mesial line of the vomer are compressed, with trenchant edges and tricuspidate; the central cusp is much larger than that at

the root of the anterior and posterior margin. They resemble the teeth of certain sharks, and are placed at intervals; more than from 5 to 7 are seldom present. Of the three longest, in the middle of the vomer, none exceeds $\frac{1}{3}$ of the horizontal diameter of the eye; their breadth is $\frac{1}{2}$ of the length. Of the three single series on each branch of the lower jaw the external and internal are equally minute and close. The middle series are much larger, tricuspidate, compressed and trenchant. The tongue resembles that of *talabon*, but the upper lip between the notch and the eye is fleshy, and covered with minute pointed lobes of the skin, which resemble velvety teeth; otherwise the lips present no difference. The vertical diameter at the occiput equals the distance from the muzzle to the eye, $\frac{1}{4}$ of the length of the head, of which the greatest diameter of the body is $\frac{1}{3}$. The tail is more tapering than in *talabon* so that the vertical diameter in front of the caudal is from $\frac{1}{10}$ to $\frac{1}{12}$ of the greatest diameter of the body. All the fin-rays are double. The pectorals are rounded; their length is $\frac{1}{4}$ of the head. The dorsal commences more in front of the gill-opening than in *talabon*, at a distance from the root of the upper pectoral ray of from $\frac{1}{2}$ to $\frac{2}{3}$ of the length of that fin. The longest dorsal rays are $\frac{1}{3}$ to $\frac{1}{2}$ of the greatest vertical diameter of the body. The caudal is so closely joined to the dorsal and anal, that the rays cannot be distinguished but by their position; their length is about $\frac{1}{2}$ of the longest dorsal. The anus opens at, or a little in front of, the end of the second fifth of the total length. The fin commences immediately behind the anus; the longest rays scarcely exceed $\frac{1}{2}$ of the dorsal ones.

The description of *Muræna bagio*, a drawing in Buchanan's duplicate series thus marked in his own hand-writing, and comparison of individuals from the Straits of Malacca and Calcutta prove the identity of the species. Those from the latter locality are of a darker olive colour, and not golden like those frequenting the sea. Buchanan has observed the strong resemblance of *bagio* and *Taloo Paum*, Russell, No. XXXVI. p. 25. In the not very explicit description of the latter, the upper jaw is characterised as being "somewhat shorter than the lower," which, if correct, militates against the identity of the two. *Muræsox tricuspidata*, McClelland, offers no character different from *bagio*, but the dentition is incorrectly described. Such is also the case with *Muræsox bengalensis*, McClelland. Of Buchanan's drawing of *Mu-*

ræna bagio, (*Muræsox hamiltonii*, McClelland,) an incorrect copy is given in *Calc. Journ. of Nat. Hist.* Pl. VIII. Fig. 3.* This species Mr. McClelland observes he never met; yet the short description of *Muræsox bengalensis*, McClelland, differs from the former in no essential character, except in the number of fin rays, which comparison proves is liable to considerable individual variations in the present species as well as in *talabon*. Buchanan himself is doubtful about the correctness of his number of rays of *bagio*. *Conger hamo*, Temminck et Schlegel, from Japan, only differs in the colours of the body which above is greyish brown, and in having the iris silvery. In the Straits of Malacca young individuals of *Conger bagio* are as plentiful as *talabon*. Both are fierce and of voracious habits, preying upon fishes and crustacea, and their bite is dreaded by the fishermen.

The anatomy of this species offers some slight differences from *C. talabon*. The heart is situated nearer the head, immediately above the gill-openings. The œsophagus extends but as far behind the latter as half the distance from the muzzle to the angle of the mouth. The cylindrical stomach extends to the anus and is $\frac{1}{5}$ of the total length, of which the intestine is $\frac{1}{3}$. The right lobe of the liver is a little larger than the left. The pearl-coloured coats of the spindle-shaped air-vessel are thick, not transparent; the length is contained a little more than $2\frac{1}{2}$ times in the total.

Gen. Ophiurus, *Lacépède*, 1800.

(Leptognathus,† *Swainson*, 1838.—Ophithorax,‡ *McClelland*, 1844).

Dorsal and anal terminating before reaching the end of the tail, which is without fins, terminating like a puncheon; posterior aperture of the nostril opens on the margin of the upper lip.

* The drawing was first inscribed "*Ophisuroides*," afterwards altered by Buchanan himself to "*Muræophis bagi*." It represents the fish stretched, and thus correctly gives the proportions. In Mr. McClelland's copy above quoted the fish is doubled, by which some of the proportions are lost, and the apertures of the nostrils are incorrectly copied.

† *Classif. of Fishes*, I. 221, Fig. 42; II. 334.

‡ (Scr. Ophiothorax.) *Calcutta Journal, Nat. Hist.* V. 173 and 212.

A *With globular teeth.*

Ophiurus baccidens, Cantor.

Plate V. Fig. 1. (Natural size.)

Head above and back dull greenish olive; lighter on the sides, dotted with brown; throat and abdomen greenish- or bluish white; fins pale olive-grey or white, dotted with brown; dorsal edged with black. Iris golden greenish olive; pupil horizontally lanceolate.

D 259 to 271, A 167 to 180, P 17, Br. XXXIV.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Total length: 3 feet.

The general form is thick, heavy; the head broad, the muzzle short, depressed, pointed; the body cylindrical; the tail gradually compressed and tapering to a short point. The length of the head, from the muzzle to the gill-opening, is contained from $8\frac{1}{2}$ to $8\frac{3}{5}$ times in the total. The distance from the muzzle to the anterior orbital margin is $\frac{1}{6}$ of to $6\frac{1}{3}$ times in the length of the head; the eye, bordering upon the forehead and the lip, occupies the third-eleventh of the length of the head; the distance between the anterior orbital margins is $1\frac{2}{3}$, between the posterior ones it is 2 horizontal diameters of the eye. The posterior orbital margin is situated a little in front of the angle of the mouth, the distance between which and the muzzle is contained $3\frac{1}{2}$ times in the length of the head. On each side of the crown of the head, from between the eyes to the muzzle, appears a series of four distant pores; behind each eye are three such vertically placed on each side, on the occiput two, along each side of the upper lip five or six, and beneath each branch of the lower jaw six such pores. The upper lip is fleshy, and lax, and gives the symphysis a more rounded outline than it really has. On each side of the symphysis opens the anterior nasal aperture through a voluminous tube. The posterior apertures perforate the lower surface of the lip; they are linear, terminating obliquely outwards beneath the anterior orbital margin, and have a valve on the external margin; their length is $\frac{1}{2}$ of the diameter of the eye. About midway between the anterior and posterior apertures appears a small pointed lobulet, and a smaller one immediately behind the posterior aperture. The middle of the lower surface of the point of the muzzle is occupied by a rounded cluster, (nearly of the size of the eye,) of globular teeth, like minute pearls, of which two or three in the centre are

a little larger than the rest. A little behind this cluster commence the teeth of the middle line of the palate which resemble the former, and are arranged in the shape of a short dagger. On each side of the jaw is an elongated, pointed and backwards diverging band of teeth. They commence with a narrow interval from the handle of the dagger and are all globular, except a single series of minute pointed teeth along the internal margin of each band. The lower jaw is one diameter of the eye shorter than the upper, leaving uncovered the point of the muzzle with its teeth and the nasal tubes. The teeth resemble those of the upper jaw with a similar internal series of pointed ones; the band of each branch is separated by a narrow interval on the symphysis. The tongue is oval and tied to the floor of the cavity extending but little in front of the posterior third of the mouth. The vertical diameter at the occiput is $\frac{1}{3}$, at the anus $3\frac{1}{3}$, at the termination of the dorsal and anal $\frac{1}{16}$ of the length of the head. All the fin rays are double; those of the dorsal and anal undivided. The rounded pectorals are placed obliquely a little behind the gill-opening; their length is $\frac{1}{3}$ of the head; the distance from the muzzle to the root of the upper ray is contained $8\frac{1}{2}$ times in the total length. The dorsal commences above the end of the anterior third of the pectorals and terminates rather abruptly at a distance from the compressed point of the tail equal to the diameter of the eye; the largest rays do not exceed the distance from the muzzle to the anterior orbital margin. The anus opens two diameters of the eye behind the termination of the second fifth of the total length. The fin commences immediately behind the anus, and terminates opposite the dorsal which it resembles in length. The lateral line commences from the side of the occiput, occupying the upper third of the side till it reaches the anus, from whence it continues in the middle to the point of the tail. Beneath it is accompanied by a series of pores, one diameter of the eye distant from each other. This species is numerous at all seasons. In external appearance it resembles *O. cancrivorus*, Richardson (*Zool. Erebus and Terror, Fishes.* Pl. 50, Fig. 6,) but the latter is more slender, the teeth of the jaw and palate appear in front to coalesce; there are no pores behind the eyes, but four along each branch of the lower jaw. The heart is placed immediately behind the gill-openings. The apex of the heart is clasped by the bifid anterior extremity of the broad, thick,

single-lobed liver which extends to cardia and pylorus; it is of a brownish lake colour; the small gall-bladder is almost entirely imbedded in the substance of the liver. Both cardia and pylorus are situated at the end of the second eleventh of the total length. The cylindrical elongated stomach extends to within a short distance from the anus; the anterior third portion is thick, muscular, with internal longitudinal folds; the rest of the sac is membranous, without folds, and widened at the transition. The duodenum is wider than the rest of the canal, the length of which is $\frac{1}{3}$ of the total. The pale crimson spleen is short, linear, adhering to the duodenum. The silvery-white air-vessel is linear, spindle-shaped; it commences a little in front of the posterior half of the distance between the muzzle and anus, at the origin of the membranous portion of the stomach and extends but a little into the cavity of the tail. The latter terminates as far behind the anus as the anterior half of the total length. The cavity contains the bluish grey kidneys, which extend but a little in front of the anus, and the ovaries, which farther occupy nearly the whole length of the abdominal cavity, and extend to halfway between the pylorus and the heart. The ova are very minute of a whitish yellow colour.

Ophiurus boro, Buchanan Hamilton.

Plate V. Fig. 2, (Nat. size.)

Ophisurus boro, Buchan. 20, 363.

(*Icon.*) Ophisurus boro, Gray: Ill. Ind. Zool. I. Pl. 95, Fig. 1.

Ophisurus boro, McClelland: Calc. Journ. Nat. Hist. V. 185, 211.

Ophisurus boro, Richardson, Report, 1845, 313.

Ground-colour whitish yellow; upper half of head and body, so closely dotted with black, as to produce a general blackish appearance; dorsal pale olive white, dotted and edged with black; anal white; pectorals pale yellowish olive dotted with black; abdomen white. Iris pale golden, dotted with black.

D 315 to 328, A* 205 to 244, P 13, Br. XXXI.

Habit.—*Sea of Pinang.*

Estuaries of the Ganges.

Total length: 2 feet $2\frac{4}{8}$ inch.

* These are the greatest variations in individuals examined at Pinang and in Calcutta. Buchanan counts: "A 270 ?"

The greater part of the body is cylindrical, of nearly equal diameter, but the posterior seventh is gradually compressed and tapering. The length of the head to the gill-opening varies from $9\frac{1}{2}$ to $10\frac{2}{5}$ times in the total; it appears constantly to be $\frac{1}{4}$ of the distance from the muzzle to anus. The latter is situated either at or a little in front of the end of the second-fifth of the total length. The horizontal diameter of the eye is $\frac{1}{17}$ of the length of the head. The distance from the muzzle to the anterior orbital margin equals two diameters, or the distance between the eyes across the forehead. The distance from the muzzle to the angle of the mouth is contained $3\frac{1}{2}$ times in the length of the head; the lower jaw is one diameter of the eye shorter than the upper. The nostrils, their lobulets, and the tongue resemble those organs of *O. baccidens*. Beneath the muzzle is a small rounded spot with globular teeth, some of which are larger than the rest, which are continued on an elongated pointed band along the mesial line of the palate. The broadest part of this band contains 4 to 5 series. The teeth of the upper jaw are somewhat smaller than the palatal ones, with which they do not coalesce; the broadest, anterior, portion contains about five series, of which the internal one consists of minute pointed teeth. The bands of the lower jaw have a linear interval over the symphysis, the broadest portion; the teeth resemble those of the upper jaw, but there appear no series of pointed teeth. From between the eyes, on each side of the crown of the head, proceed a series of four distant pores to the muzzle; behind each eye appear three, and there are other series along both jaws and across the occiput. The lateral line resembles in its course that of *O. baccidens*, but the line itself and the pores are more minute. The vertical diameter at the occiput is contained $3\frac{3}{4}$ times in the head; the greatest one of the body is $\frac{1}{3}$ of the length of the head; that between the termination of the dorsal and anal is 2 diameters of the eye, and constitutes the base of an equilateral triangle formed by the compressed tip of the tail. The dorsal, which is partly concealed in a deep groove of the back, commences at a little distance behind the apex of the pectorals, the distance from the root of the upper pectoral ray to the first dorsal varies from $\frac{1}{3}$ of to $2\frac{2}{3}$ times in the distance from the muzzle to the dorsal. The rays of the dorsal and anal fins are $\frac{3}{4}$ of the length of the pectorals which measure $\frac{1}{5}$ of the head.

Single individuals are taken along the coasts of Pinang at irregular intervals.

B. With pointed teeth.

Ophiurus grandoculis, Cantor.

Plate V. Fig. 3, (Magnified.)

Ground-colour of head back and sides yellowish white, minutely and closely vermiculated with brown, and dotted with black, so as to produce a general browuish appearance, lighter on the sides; abdomen white; fins greyish white; minutely dotted with black; dorsal and posterior half of anal edged with black. Iris pale golden, dotted with black.

D 251 to 258, A 152 to 167, P 15, Br. XXXI.

Habit.—*Sea of Pinang.*

Total length: 1 foot $6\frac{4}{8}$ inch.

The head is elongated with a conical, somewhat bluntly pointed muzzle, the general form of the body resembles that of *O. boro*. The length of the head to the gill-opening is contained $11\frac{1}{5}$ to $11\frac{3}{4}$ times in the total, but $4\frac{1}{2}$ to $4\frac{2}{3}$ times in the distance from the muzzle to the anus. The eye is comparatively large, its horizontal diameter varying from $\frac{1}{11}$ to $\frac{1}{13}$ of the length of the head; the distance from the muzzle to the eye is two diameters; the eye itself occupies nearly the whole space between the lip and the profile; the distance across the forehead equals one diameter. The distance from the muzzle to the angle of the mouth is contained $3\frac{1}{2}$ times in the length of the head; the lower jaw is half a diameter of the eye shorter than the upper. The nostrils, lobulets, pores of the head and of the lateral line, as well as the latter itself, resemble those of *O. boro*. The middle of the tip of the upper jaw has two close series of subulate teeth; in the young each series consists of 3 to 4, but one half of them appear to vanish with age, when those remaining become stronger and blunter. At a short distance behind these commeuce the double series of teeth of the mesial line of the palate; those of the anterior half are longer than the rest, and become subulate with age; on the posterior half the teeth are much smaller, and placed three deep. The teeth of the jaw commence on each side of those of the mesial line without coalescing with them; they are placed in a single series, are small, pointed or subulate. Those of the lower jaw are also in a single series,

subulate, and they decrease from the symphysis, on which there is a toothless interval between the series of both branches. The tongue is small elongated and tied to the floor of the mouth, of which it occupies the posterior third. The vertical diameter at the occiput is $\frac{1}{3}$ of the greatest of the body is contained $2\frac{1}{2}$ times in the length of the head, while that between the terminations of the dorsal and anal equals the diameter of the eye and forms the base of the triangular tip of the tail, each of the sides of which is two diameters of the eye. The dorsal commences above the posterior third of the pectorals. The distance from the root of the upper pectoral ray to the dorsal is $4\frac{2}{3}$ to 5 times in that from the muzzle to the dorsal; the general length of the dorsal rays is contained $5\frac{1}{3}$ times in the head; but immediately before the termination of the fin, the rays suddenly increase in length, and are but $4\frac{1}{4}$ times in the head. Such is also the case with the anal, which resembles the dorsal. The anus is situated a little in front of the end of the third-fifth of the total length. The pectorals are elongated, $\frac{1}{3}$ of the length of the head. Single individuals occur at all seasons at Pinang. The present species bears a general resemblance to *O. hijala*,* Buchanan Hamilton, but in the latter the dorsal commences at a short distance behind the pectorals.

* Buchan. Ham. pp. 20, 336, Pl. V. Fig. 5. Syn. *O. hyala*, Cuv. R. A. II. 351. (1)—*O. puncticulata*, Swainson, II. 334.—*O. rostratus*, McClelland, Calc. Journ. Nat. Hist. V. 184, 211.—*O. hyala*, McClelland, ibid. V. 184, 185.—*O. hijala*, McClelland, ibid. V. 211.—*O. minimus*, McClelland, ibid. V. 185, 212, Pl. X. Fig. 3.—*O. caudatus*, McClelland, ibid. V. 185, 204, Pl. XII. Fig. 3.—*O. rostratus*, Richardson: Report, 1845, 313.—*O. hijala*, Richardson, ibid. 314.—With regard to the nomenclature of Mr. McClelland, it is necessary to observe that the duplicate series of Buchanan Hamilton's drawings contains a figure of this eel, marked in Buchanan's handwriting. "*Ophisuris rostratus*," which is evidently the same as Pl. V. Fig. 5, *O. hijala, (Fishes of the Ganges.)* In publishing the figure and the description, Buchanan chose to alter his manuscript name "*rostratus*" to "*hijala*." It is this, by Buchanan himself *cancelled manuscript name* "ROSTRATUS," which Mr. McClelland has introduced as if it were a species distinct from *hijala*, and of which he says: "I have not met with it, but it is closely allied to *Oph. minimus*, from which it only differs in having a square muzzle."—*O. minimus*, McClelland, is characterised as having "the distance from the point of the muzzle to the eyes equal to 1-5 of the distance from the eyes to the pectorals." But in Mr. McClelland's figure (Pl. X. Fig. 3,) the former distance is *one-third* of the latter, exactly as represented in the outline of *O. hijala*, Buchanan, (Pl. V. Fig. 5.

Ophiurus breviceps, Cantor.

Plate V. Fig. 4, (Magnified.)

Head above and back greenish olive, lighter on the sides of the head and body, everywhere minutely dotted with black; throat and abdomen greenish white; dorsal greenish white, dotted and edged with black; pectorals and anal greenish white dotted with brown. Iris pale greenish golden, dotted with black.

D $\begin{cases} 480, \\ 448, \end{cases}$ A $\begin{cases} 276, \\ 298, \end{cases}$ P 13, Br. XXXI.

Habit.—*Sea of Pinang.*

Total length: 2 ft. $2\frac{7}{8}$ inch.

The head is proportionally very short, elongated conical, terminating in a narrow truncated muzzle; the eye small; the body cylindrical, suddenly deepening behind the anus, and slowly tapering towards the small blunt point of the tail. The length of the head is $\frac{1}{1\,8}$, or a little less, of the total and contained $5\frac{3}{4}$ to $5\frac{2}{3}$ times in the distance from the muzzle to the anus. The latter is situated either in the middle of the third-eighth or a little in front of its termination. The horizontal diameter of the small oval eye is contained $13\frac{1}{2}$ times in the length of the head; the distance across the forehead is $1\frac{1}{2}$ diameter; that from the muzzle to the eye $2\frac{1}{2}$ such diameters. The distance from the muzzle to the angle of the mouth is contained $3\frac{1}{2}$ times in the length of the head. The upper jaw is a little less than one diameter of the eye longer than the lower. The nostrils and their lobulets, the pores of the head and the lateral line resemble those of *O. boro*. The very minute whitish pores beneath the lateral line are placed at a distance from each other of two diameters of the eye. On the mesial line of the tip of the upper jaw appear two series, each consisting of three small pointed recurvous teeth. At a short distance behind the latter commences the series of the mesial line of the palate;

Fishes of the Ganges.)—Of *O. minimus*, McClelland, it is farther said: "the distance from the muzzle to the branchial apertures, is equal to the distance from these to the commencement of the dorsal." In the figure, however, the former distance slightly, yet perceptibly, exceeds the latter, just as it is represented in the figures of *O. hijala*, Buchanan Hamilton. In *O. caudatus* McClelland, the distance from the base of the pectorals to the dorsal is described as equalling half the distance from the pectorals to the end of the muzzle. In Mr. McClelland's figure, however, the former distance is represented as contained $2\frac{2}{3}$ times in the latter.

the anterior teeth are a little stronger than the rest, and placed three deep, then two, and posteriorly in a single series of excessively minute teeth. On each side of the mesial series commences a single one of fine, pointed teeth, which is the internal series of the jaw; behind the posterior aperture of the nostril commences an external series of similar teeth. Those of the lower jaw resemble the latter, but they are throughout placed in a double series, except over the symphysis which is naked. The small elongated tongue is tied to the floor of the mouth; it is placed unusually far forwards and nearly extends to the anterior third of the cavity. The vertical diameter continues uniform from the occiput to the anus, varying in two individuals examined, from $3\frac{1}{2}$ times in, to $\frac{1}{4}$ of the length of the head, while their greatest diameters of the two anterior thirds of the tail vary from $\frac{1}{2}$ to $\frac{1}{3}$ of the head. The vertical diameter between the termination of the dorsal and anal is but two diameters of the eye, forming the base of the equilateral triangular point of the tail. The small pectorals are from $\frac{1}{3}$ of, to $3\frac{1}{2}$ times in the length of the head. The dorsal commences above the apex of the pectorals. Its distance from the root of the upper pectoral ray equals the length of the pectoral fin, and is $\frac{1}{4}$ of its distance from the muzzle. The length of the dorsal rays is but $\frac{1}{5}$ of the head. The anal rays are a little longer. Two individuals occurred together at Pinang in November 1844. Although there was a difference of but $2\frac{2}{8}$ inch in length, the longer was out of proportion, the thicker.

Gen. Dalophis, *(Rafinesque** 1810.*) Swainson,* 1839.

No pectoral fins; gill-openings placed very low, towards the sides of the throat; dorsal and anal terminating before they reach the end of the tail, which is naked; body cylindrical, mouth small with minute sharp teeth; nostrils tubular; dorsal fin commencing a little behind the head; vent nearly central; upper jaw much longer than lower.

Dalophis anceps, Cantor.

Plate VI. Figs. 1, 2, 3, 4.

Ground-colour of head, back and upper half of sides yellowish white, so sparingly dotted with brown as to acquire a greyish or dusty appearance; beneath the lateral line a pale bluish grey longitudinal band; abdomen white; dorsal and anal hyaline, the lower half of the

* Swainson: *Classif.* I. 221; II. 335.

former dotted with brown. Iris silvery; orbital margin black; pupil circular, black.

D 251? A 151, Br. XXXI?

Habit.—*Sea of Pinang.*

Total length: 1 foot, 8 inch.

The head is comparatively short, terminating in a short conical muzzle; the eye very minute; the body is slender, cylindrical, but widens suddenly a little before the termination of the dorsal and anal; the naked tip of the tail is slightly compressed and much blunter than the muzzle. The head, measured to the gill-openings, is $\frac{1}{19}$ of the total length; it is contained $10\frac{3}{4}$ times in the distance from the muzzle to the anus, which is situated at the end of the fourth-seventh of the total length. The very minute eye is situated at the commencement of the second-eight of the head, nearly above the middle of the lip; its distance from the muzzle is a little more than $\frac{1}{8}$ of the head; the distance between both eyes is a little less. The distance from the muzzle to the angle of the mouth is contained $4\frac{1}{2}$ times in the length of the head. Between the muzzle and each eye, on the crown of the head, appear three distant pores and five similar on each branch of the lower jaw. The anterior nasal apertures are tubular and open on each side of the point of the muzzle; although very small, each tube is double the length of the diameter of the eye; there are apparently no lobulets; the posterior nasal apertures open through the lower surface of the upper lip, beneath the eyes, as in *Ophiurus*. Beneath the tip of the muzzle appears a double series, each of three very minute pointed teeth. At a short distance behind the latter commences the series of the mesial line of the palate; the anterior part is double, each side consisting of fine teeth which are longer than all the rest, the posterior part is single. The teeth of the upper jaw are minute, distant and placed in a single series, which commences a little behind the anterior teeth of the palatal series. The lower jaw is shorter than the upper; the symphysis is naked; the teeth are minute, pointed and generally in a single series, but near the symphysis appears on each side a short internal series, consisting of three minute teeth. The tongue is very minute, elongated and tied to the floor of the mouth; it does not extend beyond the angle of the mouth. From the occiput to the tail the vertical diameter is contained $3\frac{1}{2}$ times in the length of the head; the tail slowly increases in depth to a little in

front of the termination of the dorsal and anal, where the vertical diameter suddenly attains its maximum, $2\frac{1}{2}$ times in the length of the head. Between the termination of the dorsal and anal the vertical diameter is contained $4\frac{1}{2}$ times in the head, and it forms the base of the bluntly conical tip of the tail, the upper and lower margin of which slightly exceed the base. Owing to the lowness and thickness of the dorsal fin-membrane its precise origin cannot be determined; apparently it commences at a distance from the muzzle of $\frac{1}{8}$ of the total length, but the rays cannot be distinguished before a little in front of the anterior third of the total. The general length of the rays is $\frac{1}{8}$ of the head, but it slightly increases above the sudden enlargement of the tail near the termination of the fin. The anal commences at a short distance from the vent and resembles the dorsal. The gill-openings are small, crescent-shaped and placed between the lateral line and the abdominal profile without bordering upon either; the distance from the apparent commencement of the dorsal exceeds by $\frac{1}{4}$ the length of the head or the distance from the muzzle to the openings. The lateral line commences on the anterior third, but descends at a short distance from the head to the middle of the side and thus continues to the tip of the tail; it consists of a succession of short upwards-arched tubes, apparently without pores.

The species described by Russell (No. XXXVII. *Manti Bukaro Paumu*), which according to Cuvier is identical with *Cœcula pterygea*, Vahl,* differs from the present by its much shorter thicker head, and by the anus being situated in the middle of the total length. A solitary individual of *Dalophis anceps* occurred at Pinang, with two of *Ophiurus breviceps*, in November 1844.

Gen. Muræna, ([*Artedi*,] *Linné*, 1766,) *Cuvier*, 1817.

(Gymnothorax, *Bloch-Schneider*, 1801.—Murænophis, *Lacépède*, 1803.—Lycodontis, *McClelland*, 1844.—Strophidon, *McClelland*. 1844.—Thærodontis, *McClelland*, 1844.)

Pectorals none; branchiæ open on each side by a small hole; opercles thin; branchiostegous rays slender, concealed under the skin;

* *Skrivter af Naturhistorie Selskabet. Kjöbenhavn.* III. Pl. XIII. 1, 2.—*Sphagebranchus pterygea*, Cuv. *R. A.* II. 353 (2).—*Dalophis orientalis*, McClelland: *Calc. Journ. Nat. Hist.* V. 213.

stomach a short sac; air-vessel small, oval, placed towards the upper part of the abdomen.

Muræna thyrsoidea, Richardson.

Plate V. Fig. 5. (Nat. size.)

Muræna thyrsoidea, Richardson: Ichth. Sulph, 111, Pl. 49.

Muræna thyrsoidea, Richardson: Report, 1845, 314.

Muræna grisea, Bleeker: Verh. Bat. Gen. XXII. 11.?

Head, body and fins of darker or lighter pitch colour, so closely and finely marbled and dotted with white or yellowish white, as not to affect the general dark colour; abdomen lighter than the rest of the body. Iris pale golden, minutely dotted with black.

D, C, A } 569 to 611, Br. IX.

Habit.—*Sea of Pinang.*

Canton, China Seas.

Total length: 2 feet 2 inch.

The form of the body is compressed, of nearly uniform depth. The length of the head to the gill-opening is contained from $7\frac{1}{2}$ to $7\frac{2}{3}$ times in the total, or about $3\frac{1}{2}$ times in the distance from the muzzle to the anus. The horizontal diameter of the eye is $\frac{1}{10}$ to $\frac{1}{11}$ of the length of the head; the distance across the forehead is $1\frac{1}{3}$ diameter; the distance from the muzzle to the eye is two such; that from the muzzle to the angle of the mouth is about $\frac{1}{2}$ of the length of the head. The anterior apertures of the nostrils open through two small tubes, situated on each side of the muzzle, at a distance from one another of one diameter of the eye. The posterior apertures are small, oval, with a narrow membranous edge; each is placed above the forepart of the orbit. On the upper lip appear on each side four distant pores, and on each side of the lower lip four similar ones. Sir J. Richardson has traced scales before the gill-opening. Both jaws are of nearly equal length and armed with two series of teeth. Those of the outer series are minute, yet strong, pointed with trenchant edges, and the series of both sides are uninterrupted on the symphysis of the upper jaw. Those of the inner series are more distant, thicker and longer. On the mesial line of the upper jaw appear four or five longer, distant, subulate teeth, which gradually increase in length, and are moveable. The rest

of the mesial teeth are minute subulate, headed by one longer than the rest, which are at first placed in a double, but terminate in a single series. Neither tongue nor lateral line are distinguishable. The vertical diameter at the occiput is contained $2\frac{1}{2}$ times in the length of the head. The anus is situated half the length of the head behind the middle of the total length. The gill-opening is small, oval and placed obliquely, nearer the abdomen than the back. The dorsal commences three diameters of the eye in front of the gill-openings. The rays increase in length towards the posterior half of the tail where they are $\frac{1}{3}$ of the length of the head. The caudal is but $\frac{1}{7}$ of the head and so closely attached to the dorsal and anal that its origin cannot be distinguished. The anal commences a little behind the vent: it resembles the dorsal. All the fin rays are double, and hid in the membrane. This species greatly resembles *Muræna tile*,* (Buchanan Hamilton,) which, however, may be distinguished by a slightly differing dentition, by the vent being situated one or two diameters of the eye before the middle of the total length, and by its colours. Single individuals of *M. thyrsoidea* occur at all seasons at Pinang.

MURÆNA SATHETE, (Buchanan Hamilton.)

Murænophis sathete, Buchan. Ham. 17, 363.

Lycodontis longicaudata, McClelland: Calc. Journ. of Nat. Hist. V. 187. Pl. VIII. Fig. 2.

Strophidon longicaudata, McClelland: ibid. 215.

Muræna sathete, Richardson: Voy. Erebus and Terror, 91.

Head, body and fins dark greenish olive, throat and abdomen greenish yellow.

D† C A } ? Br. IX.

* SYN. *Muræna tile*, Buchan. Ham. 18, 163. *(Synon. excl.)*—*Lycodontis literata*, McClelland: Calc. Journ. of Nat. Hist. V. 186, Pl. VII. Fig. 2—*Lycodontis punctata*, McClelland, *ibid.* 187, Pl. VII. Fig. 3.—*Strophidon literata*, McClelland, *ibid.* 215.—*Strophidon punctata*, McClelland, *ibid.* 215.—*Strophidon maculata*, McClelland, *(Muræna tile baim*, Buchan. MS.) *ibid.* Pl. VIII. Fig. 1.

† Mr. McClelland counts; D 484, A 394, (l. c. 187.)

Habit.—*Freshwater and Sea of Pinang.*
Gangetic estuaries.
Total length: 7 feet $8\frac{4}{8}$ inch.

The general form of the body is cylindrical to the posterior half of the tail, which is tapering and compressed. The length of the head to the gill-opening is $\frac{1}{13}$ of the total or about $\frac{1}{5}$ of the distance from the muzzle to the anus. The horizontal diameter of the eye is $\frac{1}{2\frac{1}{2}}$ of the length of the head; the distance between the eyes is two diameters: that from the muzzle to the eye $2\frac{1}{2}$ diameters; to the angle of the mouth it is contained $3\frac{2}{3}$ times in the length of the head. The apertures of the nostrils resemble those of *M. thyrsoidea*. The jaws are nearly equal. The teeth of the upper jaw are placed in a single uninterrupted series; they are distant, pointed, with two or three in front of each eye longer than the rest, which are generally small. The teeth of the mesial line commence with a single series of three moveable conical teeth, of which the second is the longest of all; behind it appears a double series of very small conical teeth, which, however, soon coalesce into a single series; opposite the eye commences a single series of palatal teeth which are conical and long. Those of the lower jaw consist of an external series, which is single uninterrupted and formed of small distant conical teeth; on the anterior half of each branch appears an internal distant series composed of four long conical teeth, of which the anterior ones are placed at a little distance behind the symphysis. No tongue is distinguishable. The lateral line is marked by a series of minute white pores which follow the middle of the side to the caudal. The vertical diameter at the occiput is contained $3\frac{1}{2}$ times in the length of the head; in front of the anus it is $\frac{1}{3}$ of, but in front of the caudal it is one diameter of the eye. The dorsal originates far in front of the gill-opening, at the commencement of the posterior third of the head: the distance from the muzzle to the dorsal is $\frac{2}{3}$ of the length of the head, that from the dorsal to the gill-opening $\frac{1}{3}$. The dorsal rays are short, and hid by the membrane; their length does not exceed $\frac{1}{6}$ of the head, of which the caudal is about $\frac{1}{11}$. The anus is situated at the end of the fifth-thirteenth of the total length; the fin commences at a short distance behind the vent; the rays are a little shorter than those of the dorsal. A single individual occurred on the

coast of Pinang in May 1845; a second, a little shorter than the former, was taken the following July in fresh water.

Gen. Leptocephalus, *Gronov.* 1754.

Head small and short; teeth numerous; pectoral fins and gill-opening very small; body compressed and very thin, tape-like; dorsal and anal fins small, united at the tail, forming a point.

A species of this genus was found in the stomach of *Johnius diacanthus*, (Lacépède,) taken at Pinang. The effects of the process of digestion were such as but to admit the following characters to be ascertained. The colour was a semipellucid opal, exhibiting numerous, somewhat distant striæ, or backwards directed angles, above and beneath the lateral line; the iris was bluish silvery, the pupil circular black. The vertical diameter at the occiput slightly exceeded $\frac{1}{2}$ of the greatest one of the body, which was about $\frac{1}{15}$ of the total length. The head was small, with a short very pointed muzzle. The profile of the forehead was oblique, meeting the horizontal one of the lower jaw, which nearly equalled the length of the upper; the length of the head was contained $17\frac{1}{2}$ times in the total; the distance from the muzzle to the posterior circumference of the orbit was $\frac{1}{2}$ of the length of the head. On each side of the upper jaw appeared five forwards-directed, pointed teeth, and in the intervals between them four smaller, similar ones. Each branch of the lower jaw was armed with five teeth, somewhat longer, but resembling those of the upper jaw; minute teeth appeared in the intervals between the three anterior longer ones. The roots of the pectorals were all that remained, and were placed close to the abdominal profile, immediately behind the gill-opening. The origin of the dorsal and anal fins could not be traced. The total length of the fish was $4\frac{4}{8}$ inches. From the peculiar dentition the species might be named: *Leptocephalus dentex.* A species of *Leptocephalus* occurs in the Bay of Bengal as far as the Sandheads.*

* Mr. McClelland quotes the Gen. *Leptocephalus* as exclusively inhabiting Great Britain. (*Apodal Fishes of Bengal* in *Calc. Journ. of Nat. Hist.* V., page 226.)

FAM. SYMBRANCHOIDÆ.

Gen. Symbranchus,(*Bloch-Schneider*, 1801.) *Cuvier*, 1817.

(Unibranchapertura, *Lacépède*, 1803.—Ophisternon,* *McClelland*, 1844.)

Differs from *Sphagebranchus*† by the branchiæ communicating outside by a single aperture, pierced under the throat and common to both sides; pectorals none; vertical fins nearly entirely adipose; head thick; muzzle rounded; teeth obtuse; opercles partly cartilaginous; six strong branchiostegous rays; intestinal canal straight; stomach distinguished by its being a little wider, and by a pyloric valve; cœca none; air-vessel long and narrow.‡

Symbranchus caligans, Cantor.

Plate VII. Figs. 1, 2, 3.

Bálut of the Malays.

(*Young?*) Head above and back impure lake-coloured with livid

* "Ophisternon:" (*Scr.* Ophiosternum.) "*A single transverse opening under the throat common to both branchiæ. These consist of four pectinated combs on each side. Two bands of teeth on the edges of the upper jaw, 5 short cartilaginous branchial rays. Eyes small and placed on the muzzle, teeth disposed in bands on the sides of the jaws.*" (McClelland: Calcutta Journal, Nat. Hist. V. 220.) Of the preceding characters the following are erroneous: "*two bands of teeth on the edges of the upper jaw,*" and "5 *short cartilaginous branchial rays.*" The upper jaw carries but a *single* band of teeth, and there are *six* branchiostegous, *bony* rays on each side. After these errors have been corrected, it is evident that *Ophisternon*, McClelland, is identical with *Symbranchus*. Mr. McClelland himself quotes the diffinition of *Symbranchus*, Bloch, immediately preceding that of *Ophiosternum* (l. c. 175), yet, he observes: "*their branchiæ are not described further than that the membrane contains six strong rays.*" (l. c. 157.) As Cuvier, however, has confined his diffinition to the differential characters by which *Symbranchus* is distinguishable from *Sphagebranchus*, the simple inference from his silence concerning the branchiæ is, that both genera have the same number (four) on each side.

† Sphagebranchus (Bloch-Schneider 1801.) Cuvier, 1817. Differs from *Muræna* principally by the branchial apertures approaching each other under the throat; the vertical fins in several species commence to project near the tail; muzzle extended and pointed; stomach like a long cul-de-sac; intestine straight; air-vessel long, narrow and placed far back.

‡ The Asiatic species, quoted in the following, have no air-vessel.

reflections, lighter on the sides and abdomen ; throat pale livid ; dorsal-, caudal- and anal- membranes pale carmine.

D 0
C 10 } Br. VI.
A 0

Habit.—*Sea of Pinang.*

Total length : $8\frac{2}{8}$ inch.

The head is conical, depressed, with rounded muzzle, swelling towards the occiput ; the body is cylindrical with the sides slightly compressed, of nearly equal diameter ; the short, tapering tail is greatly compressed like a two-edged sword. The length of the head, from the muzzle to the gill-opening, is contained $8\frac{1}{2}$ to $8\frac{3}{4}$ times in the total. The eye, a minute black speck, is situated nearly opposite the middle of the lip ; its distance from the muzzle is $\frac{1}{7}$ of the length of the head. That from the muzzle to the angle of the mouth is $\frac{1}{3}$ of the length of the head. The minute anterior nasal apertures are situated on each side of the muzzle ; their magins are raised, not tubular. The larger, posterior apertures are situated obliquely above the eyes ; they are of a lanceolate form, with the broader part in front of and on a higher level than the eye, and with the apex extending downwards and outwards to the supraorbital margin. The lips are membranous, the under one reverted over the lower jaw, which is very little shorter than the upper. The teeth are all blunt and minute, yet there is a perceptible difference in their length. Each branch of the upper jaw carries a series of excessively fine, almost setaceous teeth, which under the symphysis become crowded and form a small triangular figure. The base of both triangles is bordered by three teeth larger than the rest, and separated by a naked longitudinal interval. The palatal teeth are longer than the preceding, and are placed in a single close series, uninterrupted on the vomer. The teeth of the lower jaw are a little stronger than the palatal, and appear truncated ; both branches carry a single series ; both coalesce on the symphysis where they expand in a semilunar band, three or four teeth deep. The fleshy tongue is elongated, conical, with rounded apex, extending to the symphysis ; it is moveable by means of a lax frænulum. The margins are thickened, rounded, forming a longitudinal groove along the upper surface of the tongue. Between the upper extremity of the hyoid bone and that of the anterior branchial

arch appears a small blind fossa, without sac, like that discovered by M. Johannes Müller in another Indian species: *Symbranchus immaculatus*, Bloch. (*J. Müller: Myxinoiden in Abhandl. der Königl. Akad. der Wissensch. zu Berlin.* 1839. *Berlin*, 1841, p. 245.) On each side of the pharynx is a small oval fleshy tubercle, behind which a second one studded with minute card-like teeth, and immediately behind the middle of the posterior branchial arch appear a few similar teeth, forming a short linear group accompanying the arch. The lax undivided gill-membrane is externally marked by some longitudinal furrows; the posterior margin is backwards arched and extends to the upper third of the side, the origin of the lateral line. The bony branchiostegous rays are short, but strong, compressed and of equal length; the four upper ones are separated by a short interval from the two lower, which are also placed farther from each other than the preceding. Of the four densely fringed branchiæ the posterior is the shortest, and closely connected to the third branchial arch by a membrane with a small oval aperture in the middle. The lateral line is a groove commencing at the angle of the gill-opening, and continuing a little nearer the back than the abdomen towards the anus; it proceeds along the middle of the side of the tail to the caudal. The greatest vertical diameter, at the occiput, is contained $3\frac{1}{2}$ times in the length of the head; at the anus $4\frac{1}{2}$. The length of the tail varies from about $\frac{1}{5}$ to $\frac{1}{6}$ of the total. The skin is naked and lubricated by mucus. The membranous dorsal commences opposite the anus, but is not distinct on the anterior third of the tail. The anal resembles the dorsal; the height of either scarcely exceeds $\frac{1}{4}$ of the vertical diameter at the anus. Both unite with the short pointed caudal, which contains ten minute, jointed, simple rays. A solitary, apparently young, individual occurred at Pinang in September 1843; a second, $6\frac{2}{5}$ inch in length, in February 1845.

The distance from the gill-opening to the heart slightly exceeds the length of the head. The digestive canal is a little less than $\frac{4}{5}$ of the total length. The œsophagus and stomach form an elongated cylinder, which gradually widens towards the pylorus, which is internally marked by a valve. The duodenum, which is narrower than the fundus of the stomach is situated in the middle of the digestive canal. The intestines form a simple cylinder, widening towards the rectum, without cæcopyloric appendages or circumvolutions. The liver consists of a

very elongated single lobe with many transversal incisions; it commences from the bulbus arteriosus, and gradually widening extends to a short distance from anus; the colour is pale reddish brown. The gall-bladder is small, oval, of a pale bluish green; it is attached to the liver at a short distance in front of the pylorus, or nearly halfway between the muzzle and the anus. The spleen is elongated oval, smaller than the gall, and situated closely behind the pylorus. There is no air-vessel.

Symbranchus caligans differs from *S. gutturalis*, Richardson, (*Ichthyol. Erebus and Terror*, 49, Pl. XXX, Figs. 14—17.) from Dampier's Archipelago, by its proportionally longer head, and shorter tail: in the latter species the head is $\frac{1}{11}$ of, the tail less than $\frac{1}{3}$ of the total length, and there are 7 caudal rays.

From *Symbranchus immaculatus*, Bloch* the present also differs by a proportionally longer head, and shorter tail. Of a number of *S. immaculatus* examined, the majority had 5 caudal rays, few 3, 6 or 7.

* Bloch. XII. 77, Tab. 419, Fig. 1. *(Excl. Habit. Surinam.)* Syn: *Synbranchus immaculatus*, Shaw, IV. 36.—*Synbranchus immaculatus*, Cuvier, R. A. II. 354(2).—*Symbranchus immaculatus*, Müller, Myxinoid. in Abh. der Königl. Akad. Berlin, 1839, 245.—*Ophisternon bengalensis*, McClelland: Calc. Journ. Nat. Hist. V. 197 and 220, Pl. XI. Fig. 1-2.—M. Johannes Müller, l. c. points out the error committed by Bloch, who considered *S. immaculatus*, which he received from Tranquebar, to be identical with another distinct species inhabiting Surinam. To avoid confusion, a specific name requires to be given to the Brasilian species. *S. immaculatus* is numerous in the Hooghly, and appears daily in the Fish Bazaars of Calcutta. Individuals exceeding 14 inches in length, are rarely seen, but they are said to attain to two feet. The description of this species given by Mr. McClelland under the name of *Ophisternon bengalensis* is defective and disfigured by the following errors. The eyes are represented as being "placed before and external to the posterior apertures of the nostril;" the branchial rays are said to be five and to be cartilaginous, and the maxillary teeth are described and figured as "forming a crescent in front under the apex of the jaw."

The posterior apertures of the nostrils are pierced vertically between, not behind the eyes; a tangent of the posterior margin of the aperture continued downwards, touches the posterior orbital margin; hut a tangent of the anterior margin of the aperture, if prolonged vertically, divides the eye. There are six, hony, branchiostegous rays, and the maxillary teeth of hoth hranches do not coalesce in a crescent beneath the symphysis, hut are separated, and terminate in two small triangles as described in *S. caligans*. In a number of individuals of *Symbranchus immacula-*

In *Ophisternon hepaticus*, McClelland, (Calc. Journ. Nat. Hist. 198 and 221, Tab. XI. Fig. 3-4) the eyes are said to be placed "a little before the posterior openings of the nostrils." Both description and figures are too defective to identify the species.

Gen. Monopterus, ([*Commerson*] *Lacépède*, 1800,) *Cuvier*, 1829.

(Ophicardia, *McClelland*, 1844.*)

With the two branchial apertures united under the throat in a transversal fissure, divided in the middle by a partition; dorsal and anal only visible in the middle of the tail and uniting at its point; teeth like those of a card in the jaws and palatals; branchiostegous rays six; branchiæ three.

tus the length of the head varied from $9\frac{1}{3}$ times in, to $\frac{1}{12}$ of the total, and that of the tail from $3\frac{1}{2}$ to $3\frac{2}{3}$. As observed by M. Johannes Müller, this species has several anatomical characters resembling those of *Amphipnous cuchia*, (Buchan. Hamilton). Syn. *Dondoo Paum*, Russell: XXXV.—*Unibranchapertura cuchia*, Buchan. Ham. 16, 363, Pl. XVI. Fig. 4. *(Synon. exclus.)*—*Synbranchus cuchia*, Cuv. R. A. II. 354 (2). *(Synon. exclus.)*—*Cuchia*, Taylor, in Gleanings in Science, II. 173.—*Synbranchus cashia*, Swainson, II. 336.—*Ophichthys punctatus*, Swainson, *ibid.*—*Amphipnous cuchia*, Müller: Archiv. 15, 1840.—*Amphipnous cuchia*, J. Müller: Myxinoiden in Abh. Berl. Akad, 1839, 244, (Berlin, 1841).—*Cuchia*, McClelland, Calc. Journ. Nat. Hist. IV. 411.—*Pneumabranchus striatus*, McClelland: Calc. Journ. Nat. Hist. V. 192 and 219, Pl. XIII.—*Pneumabranchus leprosus*, McClelland, *ibid.* 195 and 219.—*Pneumabranchus albinus*, McClelland, *ibid.* 196 and 219.

Dondoo Paum, Russell, XXXV, has been identified by the examination of a specimen in the collection of Mr. Walter Elliot, who obtained it from the Ankapilly Lake. The discovery of the lung-like sacs of this eel belongs to James Taylor, Esq. late Civil Surgeon of Dacca, and has been acknowledged by Mr. Johannes Müller. Although the treatise entitled: "*Apodal Fishes of Bengal*," has added nothing new to our knowledge of the anatomy and habits of the fish, no reference is made in it to Mr. Taylor's original communication in '*Gleanings in Science*,' (l. c.) Russell discovered *Amphipnous cuchia* in the Ankapilly Lake; Buchanan Hamilton observed the fish in rivers and ponds of the South East parts of Bengal, and Mr. W. Griffith in Assam. In December 1848 an individual was taken in the Chenaub near our camp at Ramnuggur, and in February 1849 another was taken in the Jehlum not far from our Camp at Chillianwalla. (Punjaub.)

* "Ophicardia: (Scr. Ophiocardia)." Two broad bands of teeth on the upper and one on the lower jaw; a single transverse opening under the throat, diverging on either side to the gills, which consist of three slightly pectinate fleshy

Monopterus javanicus, Lacépède.

Plate V. Figs. 6, 7, 8. (Nat. size.)

Monoptère javanais, Lacép. II. 139.

Unibranchaperture lisse, Lacép. V. 658, Pl. 17, Fig. 3.

Monopterus javanicus, Shaw, IV. 39.

Monoptère javanais, Cuvier, R. A. II. 354.

Monopterus javanensis, Swainson, II. 336.

Ophicardia phayriana, McClelland: Calc. Journ. of Nat. Hist. V. 191, 218, Pl. XII. Fig. 1.

Monopterus lævis, Richardson: Voy. Sulph. Ichth. 116.*

Monopterus cinereus, Richardson: *ibid.* 117, Pl. 52, Fig. 1-6. (*Synon exclus.*)

Monopterus? (Symbranchus?) xanthognathus, Richardson, *ibid.* 118, Pl. 52, Fig. 7?

Monopterus lævis, Richardson, Report, 1845, 315.

Monopterus cinereus, Richardson, *ibid.* 315.

Ophicardia xanthognatha, Richardson, *ibid.* 116?

Bálut of the Malays.

(Young.) Head above, back and sides above the lateral line blackish brown with bluish reflections; rest of the sides, throat and abdomen pale brownish blue; fin-membranes blackish. Iris pale golden, dotted with brown; pupil circular black.

Total length: $4\frac{5}{8}$ to $6\frac{3}{8}$ inch.

(Adult.) Ground colour of head above, cheeks, back and sides above the lateral line reddish yellow ochre, or pale greenish yellow; rest of the sides, throat and abdomen pale yellow ochre or buff; head back and sides so densely spotted with blackish brown, as to leave but

combs; no scales, five rays in each side of the branchial membrane. There is but one species known and this has no air-vessel." (McClelland: *Calc. Journ. Nat. Hist. V.* 175.) The characters by which *Ophicardia* is supposed to differ from *Monopterus* are the assigned single transverse opening under the throat, and the five branchiostegous rays:—both characters, however, happen to be erroneous, as "*Ophicardia phayriana*," like a *Monopterus*, has *two branchial apertures* and *six branchiostegous rays.*

* Sir John Richardson has identified this fish with *Unibranchaperture lisse*, Lacép.

little of the ground-colour to view like single small spots; cheeks, throat and abdomen with paler and fewer brown spots; abdomen in some individuals not spotted; lateral line of the ground-colour of the body. Iris light brown, with a narrow golden ring enclosing the pupil.*

Total length: $10\frac{4}{5}$ to $20\frac{4}{5}$ inch.

D 0,
C 2, 3, 4 or 5, Br. VI.
A 0,

Habit.—*Sea of Pinang, Malayan Peninsula.*

Arracan coast, Sunda isles, China Seas, (Hong-Kong, Canton, Chusan, Woosung.)

The general form of the fish is cylindrical, gradually tapering from the occiput, where the diameter is greatest, to the tail which is greatly compressed, like a two-edged sword, and tapers more suddenly than the body, terminating in a sharp point. The head is conical, swelling towards the occiput, the profile of which is more or less arched. Between the eyes the head is somewhat depressed, and the profile slopes towards the rounded depressed muzzle, which slightly projects beyond the rounded narrower apex of the lower jaw. Both individually and according to its age this species presents considerable variations in its external characters. The following have been found constant in a number of individuals of different size. The body is viscous and without scales. The eye is situated above the middle of the upper lip, almost bordering upon the profile; the form of the eye is oval, and it is obliquely placed, with the greatest diameter diverging backwards and downwards. The distance between the posterior margins of the eye is therefore greater than that between the anterior margins; the distances from the

* Specimens preserved in spirits of wine change the colours, and appear as described by Sir John Richardson. *Monopterus lævis*, "Corpore caryophyllaceo-brunneo immaculato, subtùs pallidiori; genis punctatis."—*Monopterus cinereus.* "The colour of the fish generally is lead-grey, paler beneath, and thickly speckled on the back and sides with small points of hair brown. There are some pale streaks on the top of the head." (*Voy. Sulph. Ichth.* pp. 116, 117.) The drawing from which *Monopterus xanthognathus* was taken, has evidently been coloured from a living or fresh fish.

eye to the muzzle, and that to the angle of the lips are nearly equal. The anterior nasal apertures are very minute, with a slightly raised margin, but not tubular, and situated on each side of the muzzle; the posterior ones open on the crown of the head; although small, they are conspicuously larger than the anterior; they are pyriform with the apex close to the centre of the supraorbital margin, and they are directed obliquely inwards, so that the distance between their fundus, which is a little beyond the anterior orbital margin, is less than that between the apex of both. The narrow lips are membranous, the upper one slightly, the lower very reflex; their commissure is situated considerably less than half the distance between the muzzle and the gill-opening. The teeth are villiform, somewhat varying in length; under a lens they appear conical, slightly recurvous, with a blunt apex. Those of the upper jaw form a narrow band, tapering towards the angle of the mouth; at the symphysis the band of each limb forms a short linear process, separated by a linear naked interval. The palatal band resembles the maxillary, but both branches coalesce on the vomer at an acute angle, and internally and externally the band is enclosed by a papillary fold of the membrane lining the palate, which gives the band the appearance of being broader than it really is. On each side of the pharynx, between the root of the posterior free gillarch and the fourth appears a small rounded tubercle, studded with minute card-like teeth. Immediately behind the middle of the fourth, posterior arch, appears a short linear group of similar teeth. The teeth of the lower jaw resemble the rest; the bands of both branches taper towards the angle of the mouth; on the symphysis they either coalesce or are separated by a linear interval. Also this band is internally lined by a papillular duplicature of the membrane of that part of the mouth. The fleshy moveable tongue is elongated, tapering into a narrow flattened and rounded apex. The upper surface is papillular, like the roof of the mouth; the anterior half is flattened and thin, the posterior is thick, hollowed into a longitudinal channel between the two rounded margins, which Lacépède from the MS. of Commerson describes as two tubercles at the base of the tongue.

Between the root of the upper extremity of the hyoid bone and the anterior gillarch, but nearer the former, appears a small blind fossa, apparently without sac, like that of *Symbranchus*. The oblique gill-openings

are almost confined to the abdominal surface, meeting at an acute angle on the throat; they are divided by a thin longitudinal septum, which does not, however, extend as far back as the angle of the gill-openings, and they consequently have the appearance of being single as in the Gen. *Symbranchus*. A fold, corresponding to the septum, appears on the external surface of the membrane. In the posterior half of each cavity appear three small, but slightly curved bony arches, with minute branchiæ. The fourth, posterior, arch is entirely hidden by the integuments. The branchiostegous rays are generally short, but unequal: the four upper ones are placed closely together, the two lower ones at some distance below the former; the second upper ray and the two lower ones are of nearly equal length, about double that of the remaining three. A linear groove marks the lateral line, which continues nearly in the middle of the side to the point of the tail. In specimens preserved in spirits of wine the contraction of the muscles produces another linear groove dividing the space between the back and the lateral line. All the preceding characters correspond to those of *Monoptère javanais*, Lacépède. The following are the characters which vary, not only according to age, but even in individuals of equal dimensions. The length of the head (measured from the snout to the hinder angles of the gill-openings,) varies from $\frac{1}{1\frac{1}{2}}$ of, to $15\frac{1}{2}$ times in the total; the tail from $\frac{1}{4}$ of to $2\frac{2}{3}$ in the total length. Generally the head is proportionally shorter in the young, but the tail longer than in the adult. The distance between the eyes, across the forehead, is anteriorly about three-, posteriorly about four diameters of the eye. On the top of the head, on the upper lip and the throat appear some minute distant pores, the number of which varies individually. Of the three united fins the two are entirely membranous; the very small caudal encloses from two to five undivided rays, so very minute, that a lens is required to observe them through the semitransparent membrane. In adult individuals they are frequently not distinguishable. The dorsal commences a little behind the root of the tail, rising into a low arch above the middle of the tail and then gradually decreasing towards the caudal. The anal may be traced from the anus in the form of a raised line, sunk in a groove; on the posterior two thirds of the tail it forms a skinny hem, less elevated than the dorsal. Both are frequently very indistinct in individuals of all ages, and can then barely be distinguished

by their semitransparency. Single individuals occur on the coasts of Pinang at all seasons.

The constant characters occur in *Monopterus lævis*, Richardson, and in *M. cinereus*, Richardson; of the inconstant characters some are applicable to either.—*Ophiocardia phayriana*, McClelland, is described as having two short tubular nostrils at the extremity of the muzzle, and five branchiostegous rays. Both characters are erroneous, and the fish nowise differs from *M. javanicus*.—*Monopterus grammicus*, (Cantor,)* observed at Chusan and in Japan, presents the following differences. The head is contained about $10\frac{1}{2}$ times in the total length, the tail from $4\frac{1}{2}$ to 5, and in a japanese specimen it was about 7 times in the total. The head is consequently proportionally longer, and the tail shorter than in *M. javanicus*. The living individuals examined in 1840 at Chusan had the head, back and sides above the lateral line of a reddish yellow ground-colour; the rest of a dark buff; the whole body covered with numerous black irregular lines, like inscriptions, leaving but little of the yellow and buff to view. In other external, and in anatomical characters they agreed with *M. javanicus*, and it remains to be ascertained if the above mentioned differences are constant, specific, or merely individual. The original of *M. xanthognathus*, Richardson† is either *M. javanicus*, or *M. grammicus*, if the latter is a distinct species.

In *Monopterus javanicus* the heart is situated at a distance behind the gill-openings of about $1\frac{1}{2}$ times the length of the head. The digestive canal is about $\frac{2}{3}$ of the total length. The œsophagus and stomach form a long canal, which gradually widens towards the pylorus, and is about $\frac{1}{2}$ of the digestive canal; on the internal surface appear some longitudinal rugæ, which terminate at a short distance from the pylorus. The origin of the duodenum is internally marked by a very distinct valve, and externally by a considerable constriction. The

* Syn. *Symbranchus grammicus*, Cantor: Ann. and Mag. of Nat. Hist. IX. 30.—*Monopterus marmoratus*, Temminck et Schlegel: Fauna Japon.—*Monopterus marmoratus*, Richardson: Report, 1845, 315. This eel is numerous at Chusan in streamlets, canals and estuaries. As it is a favourite article of food, it is kept by the inhabitants of Chusan in large jars with fresh water. But it is capable of living a considerable time out of water. It is of voracious habits, feeding on smaller fishes, and it takes hooks baited with earth-worms.

† *Voyage of H. M. S. Sulphur, Ichthyology:* 118, Pl. 52, Fig. 7.

coats of the stomach are perceptibly thicker than those of the intestines, which form a narrow cylinder without cœcopyloric appendages or circumvolutions, and widen a little towards the anus. The liver is linear, consisting of a single lobe, but subdivided by numerous small transverse incisions; it accompanies the stomach and terminates a little behind the pylorus.

ORDO PLECTOGNATHI.

FAM. BALISTISIDÆ.

Gen. Balistes, ([*Artedi*] *Linné*, 1748) *Cuvier*, 1817.

Body compressed; in each jaw a single series of eight, generally trenchant, teeth; skin scaly or granulated, but not exactly osseous; anterior dorsal composed of one or more spines, articulated with a peculiar bone, fixed to the skull and furrowed to receive the spines; posterior dorsal soft, long, opposite to a nearly similar anal; ventrals none, but a pelvic bone suspended to those of the shoulder.

Balistes conspicillum, Bloch-Schneider.

Renard: I. 15, Fig. 88.
Baliste americain, Lacépède, I. 377, Pl. 16. Fig. 2.
Balistes conspicillum, Bloch-Schneider, 474.
Balistes bicolor, Shaw, V. 407, Pl. 168.
Lesson et Garnot: Voy. de la Coquille, Pl. 9.
Quoy et Gaimard: Uranie, Pl. —— Fig. 1.
Balistes conspicillum, Cuv. R. A. II. 373, note.
Rhinacanthus conspicillum, Swainson, II. 325.
Balistes conspicillum, Richardson: Report, 1845, 201.
Balistes conspicillum, Temm. et Schl. Fauna Japon. Pisces, Tab. CXXIX. Fig. 1. *(Adult.)*

(Young, from 1 *to* 3 *inch. in length.)* Head above, back and upper half of the sides pale rust-coloured or reddish brown, with more or less distinct snuff-coloured, short, longitudinally undulating lines or spots; lower half of sides, throat and abdomen impure brownish white with pale brown patches; in some on the sides of the head and body a few

distant white dots; fins brownish white; second dorsal, caudal and anal with large brownish grey or black patches. Iris pale frosted silvery minutely dotted with brown; in some with three or four indistinct radiating brown bars; orbital margin blackish.

(From 3 to 6 inch. in length.) Yellowish-, reddish- or blackish-brown, back darker, abdomen lighter than the rest; sides, throat and abdomen in some individuals with more or less distinct rounded whitish spots*; and in others an indistinct whitish forwards arched band from eye to eye; pectorals transparent brownish grey with a blackish spot at the root; rest of the fins brownish black, darker than the body; the basal half of their membranes in some individuals with very indistinct whitish spots. Iris pale silvery round the pupil; rest black.

D 3—23, 24 or 25, C $10\frac{1}{1}$, A 20, 21 or 22, P 14 or 15, Br. VI.

Habit.—*Sea of Malayan Peninsula and Islands.*

Japan, China Sea, Natunas, Indian Ocean, Mauritius, Madagascar.

Total length: 6 inch.

When the pelvic spine is withdrawn the general outline of the body is oval. The length of the head, from the muzzle to the upper part of the gill-opening, is contained $3\frac{1}{3}$ times in the total length. The anterior angle of the orbit is situated close to the profile above the centre of the length of the head, of which the horizontal diameter is $\frac{1}{4}$; the distance across the slightly arched forehead is a little less than two diameters. Each nostril has two small tubular apertures situated a little in front of the anterior angle of the orbit; the anterior aperture is directed forwards, the posterior backwards. The mouth is small with fleshy lips. In each jaw appear eight obliquely truncated, trenchant teeth, gradually increasing in size towards the symphysis. In the teeth of the upper jaw the internal surface is larger than the external, elongated oval, flattened with a rounded impression at the anterior part. In young individuals the internal surface is finely transversely furrowed, but with age it becomes smooth. The internal surface of the teeth of the lower jaw is almost entirely hid by a small crescent-shaped

* In one individual, taken off the Natunas Isles, (4° N. L. 108° E. in the southern part of the China Sea,) the body was said to be covered with blood red spots; after having been preserved in spirits of wine, it appeared of a uniformly blackish brown.

membrane. The tongue is small, rounded, fleshy and tied to the floor of the mouth. The anterior dorsal commences a little behind the anterior third of the back, the caudal not included; the first spine is very thick, with the anterior rounded margin prickly; the sides are smooth, longitudinally striated; the length is less than $\frac{1}{2}$ of the head; but in very young individuals it is proportionally a little longer. The second spine, which at the root is in contact with the former, is much slenderer, smooth, and but $\frac{2}{3}$ of the anterior; it is easily laid down, and when it reclines, the anterior trigger-like spine spontaneously follows. The third, slender spine is placed at a distance from the second of twice its own length, which is $\frac{1}{2}$ of that of the former; it may be reclined either forwards or backwards in the groove of the back. All three spines are connected by a lax membrane. The distance from the first to the third spine equals the length of the former, and also the distance from the third spine to the posterior dorsal fin. The latter is nearly equilateral triangular. The anterior four rays, of which the first and second are undivided, rapidly increase in length; the fifth and sixth are the longest, by $\frac{1}{3}$ longer than the first dorsal spine; the succeeding rays gradually decrease; the last, which is undivided, equals the third spine. The sides of all the rays of this and the remaining fins are covered with minute spines. The extent of the base of the second dorsal equals the distance of this fin from the first dorsal spine. Its distance from the caudal equals that from the third spine. The caudal is broad with the posterior margin convex; the length is a little less than the longest dorsal rays. The anus is situated opposite the first dorsal ray; the anal fin commences opposite the fourth; the extent of the base is a little shorter than that of the posterior dorsal; in other respects the two are equal and terminate opposite each other. The length of the rounded pectorals is a little more than $\frac{1}{3}$ of the head. The pelvic spine protrudes but very little, and is but slightly protractile; externally its length equals that of the longest dorsal rays; the triangular dewlap has the anterior and posterior margins equal, but the base, from the root of the pelvic spine to the anus, exceeds by $\frac{1}{3}$ the two margins. The vertical diameter of the occiput equals the length of the head; that in front of the posterior dorsal is contained $2\frac{1}{2}$ times in the total length; when the pelvic spine is protracted the greatest vertical diameter is $\frac{1}{2}$ of the total length. The body is covered with rhomboidal prickly scales. At

a little distance beneath the back and behind the pectorals, each scale is provided with a central, backwards arched, small but strong spine, forming longitudinal series, of which upwards of 20 may be counted between the posterior dorsal and the anal, 10 on the tail. At the lower part of the dewlap these spines appear in clusters of from three to five.

The stomach is capacious, elongated; it contained remains of fish; (in several, of *Exocoetus nigripennis*, Cuv. and Val.) The intestinal canal is wide, contained about $1\frac{2}{3}$ times in the total length. The liver is large; the right lobe consists of two elongated portions; the left is broader and deeply cleft. The gall-bladder is large, ovoid, expanded with a whitish green fluid; the spleen is small. The silvery air-vessel is elongated oval, occupying the upper part of the abdominal cavity. At Pinang and Singapore this species is numerous at all seasons.

GEN. MONACANTHUS, *Cuvier*, 1817.

Scales small, covered with stiff asperities, close like velvet; extremity of the pelvis salient and spinous; anterior dorsal fin with a large prickly spine, and a second almost imperceptible.

MONACANTHUS TOMENTOSUS, (Linné.)

Seba: III. Tab. XXIV. Fig. 18.

Gronov. Mus. Tab. VI. Fig. 5.

Balistes tomentosus, Linné: Syst. 1463.*

Balistes tomentosus, Shaw, V. 401, Pl. 169.

Monacanthus tomentosus, Cuvier, R. A. II. 373 (?)

(Young.) Yellow; dewlap washed with grey; except the throat and dewlap, the rest of the body with numerous small rounded cobalt blue spots; first dorsal spine yellow with three blackish rings, membrane bluish white minutely dotted with brown; posterior dorsal, anal and pectorals yellowish, transparent; caudal rays whitish, membrane black. Iris pale golden, orbital margin blackish.

D 2—31, C $10\frac{1}{1}$, A 28, P 12, Br. VI.

HABIT.—*Sea of Pinang.*

Indian Ocean.

TOTAL LENGTH: $3\frac{4}{8}$ inch.

* Distinct from *Balistes tomentosus*, Bloch, Pl. 148, which Cuvier refers to *Pira aca*, Marcgr. 154. Mr. Swainson quotes the species of Bloch, (Sw. II. 327.)

When the pelvic spine is withdrawn, the outline of the body is elongated oval. The length of the head, from the muzzle to a little behind the orbit, is contained $3\frac{1}{5}$ times in the total. The eye is situated at a little distance beneath the first dorsal spine, and above the pectorals and gill-openings; the horizontal diameter is $\frac{1}{4}$ of the length of the head and equals the distance between the eyes. The nostrils, lips, teeth and tongue resemble those organs of *Balistes conspicillum*. The first dorsal spine rises above the eye; it is moderately strong, slightly arched and serrated both on the anterior and posterior margin; it is a little less than $\frac{1}{2}$ of the length of the head; the second spine is very slender, like a bristle and flexible, $\frac{1}{2}$ of the length of the former. Their connecting membrane extends but little behind the orbit; its distance from the posterior dorsal equals the length of the first spine. The first four rays of the posterior dorsal gradually increase in length; the fifth ray, from which the rest very slowly decrease, is but little longer than the horizontal diameter of the eye; the extent of the base is $\frac{4}{5}$ of the length of the head; the distance from the caudal is $\frac{1}{3}$ of the extent of the base. All the rays of the posterior dorsal, the anal and the pectorals are undivided and spinous on their sides. The caudal is elongated, with the posterior margin rounded; all the rays except the upper and lower, are divided; the length of the central ones is $\frac{4}{5}$ of the head. Although the anal commences a little in front of the posterior dorsal, the extent of its base is not longer; in other respects it resembles the dorsal. The pectorals are rounded, $\frac{1}{4}$ of the length of the head. The point of the pelvic spine barely projects beyond the integuments; the spine is large, arched; $\frac{3}{4}$ of the length of the head; it is very protractile, forming the anterior margin of the triangular dewlap; the base of the latter equals this margin; but the posterior margin is shorter by $\frac{1}{3}$. The vertical diameter of the protracted dewlap is contained $2\frac{1}{5}$ times in the total; in front of the posterior dorsal it is $\frac{1}{2}$ of the total. The whole body has a downy appearance from being covered with minute prickles, rough to the touch; those of the tail are a little longer than the rest. A solitary individual occurred at Piuang in July, 1844.

Monacanthus geographicus, (Péron.)

Balistes geographicus, Péron.

Monacanthus geographicus, Cuv. R. A. II. 373 (1), Pl. XI. Fig. 2. *(Young.)*

Monacanthus geographicus, Swainson, II. 327.

Ground-colour pale greenish blue with scattered small brown spots; from the anterior part of the base of the posterior dorsal to behind the eye an oblique, undulating, lilac brownish band, edged with whitish, and with numerous small brown spots; a second similar from the middle of the base of the posterior dorsal to beneath the pectorals; a third from the posterior part of the latter fin and the tail to the anus; these bands are frequently interrupted or broken up, so as to make the body resemble a geographical chart of islands; from the anterior part of the orbit three or four short radiating brownish bands; first dorsal spine greenish blue, indistinctly annulated with brown; membrane pale lilac clouded and minutely dotted with brown; rays of posterior dorsal, caudal and anal pale greenish blue; their membranes pale brownish lilac transparent; basal half of dorsal with three or four parallel undulating brown lines; anal with a dark brown net-work; anterior two thirds of caudal with numerous brown dotted lines, parallel to the posterior margin, near which 6 or 7 pale blackish lilac confluent lines; lower part of the dewlap pale whitish lilac with small brown spots. Iris frosted silvery, with indistinct radiating brownish bars.

D 2—29, 31 or 32, C $10\frac{1}{1}$, A 29, 30, 31 or 32, P 13 or 12, Br. V.

Habit.—*Sea of Pinang, Singapore, Malayan Peninsula.*

Total length: $8\frac{4}{8}$ inch.

When the pelvic spine is withdrawn, the form of the body is nearly rhombic. The length of the head, from the muzzle to a little behind the orbit is contained $3\frac{1}{3}$ times in the total. The eye is situated at a short distance beneath the first dorsal spine; the posterior margin of the orbit is immediately above the gill-opening; the horizontal diameter of the eye is contained $4\frac{1}{2}$ times in the length of the head. The outline of the forehead is concave, ascending towards the first dorsal spine; angular from side to side; the horizontal distance between the eyes equals one diameter. The nostrils, lips, teeth and tongue resemble those organs of *Balistes conspicillum*. The four upper branchiostegous rays are slender like hairs, the fifth is broad, sabre-like, with the upper margin elongated; it appears like two soldered together; the first dorsal spine is strong and a little backwards arched; the anterior surface is rounded, longitudinally furrowed and very prickly; the posterior is smooth, with about 7 strong downwards directed thorns on each side; the length of the spine equals

the distance from the muzzle to the eye. The membrane is very short and completely envelops the minute slender second spine. The furrow of the back is very short and not intended to receive the first spine, which can but partially be laid down, so as not to touch the back, by reclining the second. The distance from the first spine to the posterior dorsal fin is undulating, gradually ascending, and equals the distance from the muzzle to the first spine. All the rays of the posterior dorsal are undivided, with minute spines; the first is but little shorter than the second and third, the longest, which are $\frac{2}{3}$ of the first dorsal spine. The succeeding rays gradually decrease; the base is very sloping; its extent equals the distance from the first dorsal spine. The distance from the caudal is $\frac{1}{3}$ of the base. The anal fin is placed opposite to the posterior dorsal which it resembles. The caudal is broad rounded; in individuals from 5 inches in length and more, the upper, undivided ray, and the adjoining half of the second, divided one, project beyond the others, and form a kind of short filament. The length of the central rays are in young individuals $\frac{1}{4}$, in older $4\frac{1}{4}$, in the total. The pectorals are rounded, $\frac{1}{3}$ of the length of the head. The pelvic spine is strong, nearly $\frac{1}{4}$ of the total length, and very protractile. Near the scarcely projecting apex is a deep naked incision in the anterior margin, with five strong upwards directed thorns. At the incision there is no joint in the spine, but there is one a little lower down, so that the thorny apex of the spine is freely moveable both forwards and backwards. The figure in *Règne Animal* incorrectly represents the pelvic spine with two backwards moveable pieces. The dewlap is large, triangular, with the lower part arched, scaleless and half transparent; in it are enveloped upwards of 33 tendinous lines, the points of which slightly project beyond the margin; as many of them are divided, they have the appearance of rays. The shape of the expanded dewlap is in early age triangular; with age the posterior angle becomes truncated. The base of the triangle equals the length of the pelvic spine; the arched lower margin is by one third shorter. When the dewlap is expanded, the vertical diameter at the first dorsal spine is contained $1\frac{9}{10}$ times in the total length; between the posterior dorsal and the anal it is $2\frac{1}{3}$.

The whole body is covered with minute crowded, backwards directed spines; near the upper and lower margin of the tail appears a longitudinal series of four larger scales, each armed with a short but strong

forwards arched spine. Individuals less than about 4 inches in length, present no trace of these spines. This species has a lateral line, the course of which is distinguished by a line of spines a little larger than the rest. It commences at the posterior margin of the orbit, ascending slightly towards the posterior dorsal, when it abruptly descends towards the middle of the side, and then continues straight to the caudal. At its origin it gives off a short vertical branch to the root of the first dorsal spine; a second above the orbit and nostril towards the muzzle; a third along the lower margin of the orbit, where it subdivides in an upper branch which proceeds horizontally to the chin, and in a lower undulating obliquely downwards to the dewlap. At Pinang this species is numerous at all seasons.

Monacanthus penicilligerus, (Péron.)

Balistes penicilligerus, Péron.

Monacanthus penicilligerus, Cuv. R. A. II. 374 (²), Pl. XI. Fig. 3.

Chætodermis penicilligerus, Swainson, II. 327.

Ground-colour pale whitish green, with numerous black lines; those round the orbit radiating, those of the rest of the head and the body longitudinal, undulating; side by side, behind and between the eye and gill-opening, two large round purplish black spots, both longitudinally divided by a band of brilliant ultramarine, through which passes one of the black lines of the body; behind the orbit a smaller purplish black spot, edged with pale blue, and three similar, vertically placed between the middle of the posterior dorsal and the anal; along the base of the latter fins, the dewlap and the caudal several irregular black spots; spines of the body hyaline; lips and filaments whitish red, the latter dotted and ringed with black; dorsal spine whitish grey with black spots; membrane hyaline, dotted with brown; fin-rays brownish white; membranes hyaline; those of the posterior dorsal, caudal and anal with numerous small rounded black spots placed in series parallel with the base of the fins. Pupil black, horizontally elliptical; iris golden bronze, with six radiating pale crimson bars.

D 1—23 or 26, C $10\frac{1}{1}$, A 21 or 24, P 13, Br. V.

Habit.—*Sea of Pinang, Singapore.*

Total length: $6\frac{4}{8}$ inch.

The form is rhombic, but appears shorter and broader than that of

M. geographicus. The length of the head from the muzzle to a little behind the orbit, is contained $3\frac{1}{5}$ times in the total. The posterior margin of the orbit is situated nearly in the middle between the dorsal spine and the gill-opening the horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head; the horizontal diameter between both exceeds the diameter by $\frac{1}{3}$. The nostrils, lips, teeth and tongue resemble those organs of *Balistes conspicillum*. The upper branchiostegous ray is the longest, and closely attached to the second, which at its root appears to be double; the fourth is setaceous like the preceding, but a little removed from them; the fifth is broader than the rest, but less so than it is in *M. geographicus*. The dorsal spine is proportionally longer in young individuals; it is tetragonal, slightly arched backwards, and is armed with strong thorns on the four margins and it carries numerous long filaments like those of the body. It can but slightly be reclined; its length is less than $\frac{1}{2}$ of its distance from the muzzle; its membrane descends from the middle of the posterior surface, and extends to a little in front of the middle of the distance between the two dorsals. There appears to be no second spine. The interval between the dorsal spine and the first ray forms three slight undulations, and slightly exceeds the length of the spine. The length of the rays of the posterior dorsal differs but slightly; those in the middle, the longest, are $\frac{2}{3}$ of the spine. The extent of the base equals the distance from the muzzle to the dorsal spine. The anal commences opposite the 4th or 5th ray of the posterior dorsal, but it terminates opposite the latter. The distance of both from the caudal is $\frac{1}{4}$ of the extent of the posterior dorsal. The caudal is nearly rhomboidal; the length of the central rays is $\frac{1}{4}$ of the total. The pectorals are rounded, their length equals that of the longest rays of the posterior dorsal. The pelvic spine is very strong, less protractile than that of *M. geographicus*, but the jointed apex is more projecting; the dewlap is small, triangular, the anterior margin and the base equal the length of the caudal; the posterior margin is $\frac{1}{3}$ less. When the dewlap is protracted, the vertical diameter between the root of the dorsal spine and apex of the pelvic is contained $1\frac{2}{3}$ times in the total length; at the second dorsal it is $2\frac{1}{6}$. The body is very rough, covered with short strong spines, generally terminating in two, but frequently in more points, of which the posterior is longer than the rest and directed obliquely backwards. The spines of the body are

disposed in longitudinal series; those of the head are smaller, crowded and not in series; those of the tail are different from those of the rest of the body. No lateral line is perceptible. The filaments of the body are rather long, varying from one to three diameters of the eye; they consist of a main trunk, tapering to a brush of fine branchlets, and from three to seven lateral branches, placed in quincunx, each subdivided in minor branches, with fine brush-like points. On the sides of the head and body the filaments are few and widely scattered; they appear in greatest number round the lips, on the forehead, on both sides of the dorsal spine, in the interval between the dorsals, and on the margin from the chin to the apex of the pelvic spine. Two individuals, $3\frac{4}{8}$ and $4\frac{4}{8}$ inches in length, were observed at Singapore in May 1840, a third, $6\frac{4}{8}$ inch, occurred at Pinang in October 1844.

Gen. Alutarius, *Cuvier*, 1817.

Body elongated, covered with minute close granules, scarcely visible to the naked eye; a single spine in the anterior dorsal fin; pelvis entirely hid beneath the skin and without the spinous projection of *Balistes* and *Monacanthus*.

Alutarius oblīteratus, Cantor.

Balistes monoceros, Bloch, Tab. 147?

Balistes monoceros, Shaw, V. 399, (excl. Syn. *B. monoceros*, Linné) Pl. 168?

Alutera: Bloch, 147, Cuv. R. A. II. 374 (*) ?*

Alutera monoceros, Bloch 147, Swainson, II. 327?

(Young, $3\frac{7}{8}$ inch in length.) Head above and back pale blackish brown; upper half of the sides pale yellowish olive, with numerous half effaced, irregular, blackish brown spots; lower half of the sides, throat and abdomen light impure greenish yellow, pale silvery; first dorsal spine, membrane and caudal yellowish olive, the latter with three backwards arched, indistinct blackish bands, of which the anterior a little behind the root, the second in the middle, the third along the posterior margin; posterior dorsal, anal and pectorals pale transparent yellowish. Iris greenish yellow.

* According to Cuvier different from *Balistes monoceros*, Linné, Catesby, 19. (*Règne Anim.* l. c.)

(7⅝ *inch in length.*) Ground-colour darker; back with numerous oblique or vertical spots; sides of head, body and abdomen with similar larger ones of irregular form, all the spots of a pale, half-effaced, blackish colour; caudal rays yellowish olive, membrane hyaline, closely and minutely dotted with black; posterior margin blackish.

D 2—46 or 47, C $10\frac{1}{1}$, A 47, 48 or 49, P 14, Br. VI.

Habit.—*Sea of Pinang.*

Total length: 7⅝ inch.

The form is broad lanceolate, the abdominal profile a little more arched than the dorsal. The length of the head, from the chin to a little behind the orbit, is about ⅓ of the total. The eye is situated in the centre between the first dorsal spine and the upper extremity of the gill-opening; the horizontal diameter is a little less than ⅕ of the length of the head. The frontal outline gently slopes from the first dorsal spine to the muzzle; that of the throat is more oblique and continues in a moderate arch to the anus. The horizontal distance between the eyes exceeds that diameter of each eye by ⅓. In front of the eye appear two tubular nasal apertures, contiguous and both directed backwards; the anterior is the larger and closed by a small membranous valve. The lips are very thin, membranous and scarcely cover the teeth The latter are very pointed; in other respects they as well as the tongue resemble those organs of *Balistes conspicillum*. The linear gill-openings are placed obliquely, with the upper extremity opposite the posterior margin of the orbit, the anterior extremity extends a little farther than the orbit; in its course the gill-opening deviates a little downwards from the corresponding profile of the forehead; its length exceeds by ⅓ the horizontal diameter of the eye. The five superior branchiostegous rays are setaceous, gradually decreasing in length towards the sixth, which is the shortest, and broad, like a sabre. The first dorsal spine is rather slender slightly arched, tetragonal and armed with thorns on all four margins; the membrane is very small and completely covers the second spine. The latter is excessively minute, yet distinct. The length of the first spine equals that of the gill-opening; its distance from the muzzle is ⅓ of that of the body, not including the caudal; from the posterior dorsal it is a little less. The latter interval deviates but slightly upwards from the horizontal. The second dorsal commences a little in front of the centre of the total length; it is generally low; the longest

rays, towards the middle, equal the length of the gill-opening; the base is sloping, and equals the distance between the chin and the first dorsal spine. The interval between the last dorsal and root of the upper caudal ray is contained $2\frac{1}{2}$ times in the extent of the posterior dorsal fin, it equals the vertical diameter of the root of the caudal, but it is $\frac{1}{2}$ of the length of the latter. The anal commences a little in front of the posterior dorsal, and terminates a little farther back. In very young individuals the caudal is bluntly pointed, $\frac{1}{5}$ of the total length; in older ones it becomes rounded, and scarcely exceeds $\frac{1}{6}$ of the total. The rounded pectorals commence behind the lower half of the gill-opening, which latter they scarcely exceed in length. The greatest vertical diameter of the body, at the first dorsal spine, is $\frac{1}{3}$ of the total length; that at the first ray of the posterior dorsal is less by $\frac{1}{4}$. Four solitary individuals were at considerable intervals observed at Pinang. Shortly after death the spots of the body almost entirely disappear, and specimens preserved in spirits of wine acquire a pale dark slate-colour. They might be mistaken for *Alutarius berardi*, Lesson,* but the latter species is distinguished by a proportionally shorter head, a smaller eye; the anal fin commences a little behind the posterior dorsal, and the distance between the latter and the caudal equals the length of the caudal, and is consequently proportionally greater.

Alutarius lævis, (Bloch.)

Balistes scriptus, Osbeck, Voyage, 1. 174 ?
Balistes lævis, Bloch, Tab. 414.
Balistes monoceros, Solander.
Balistes lævis, Shaw, V. 405.
Alutera lævis, Cuv. R. A. II. 374 (*)
Alutera lævis, Swainson, II. 327.
Aleuteres lævis, Richardson, Ichth. of Sulph. 131, Pl. 61, Fig. 3.
Aleuteres lævis, Richardson, Report, 1845, 202.
Ground-colour bright yellowish green olive; round and beneath the

* Voy. de la Coquille, Ichth. 107, Pl. 7. Syn. *Aleuteres berardi*, Richardson, Ichth. of Sulph. 132, Pl. 61, Fig. 1.—*Aleuteres berardi*, Richardson, Report, 1845, 202 and 318.—*A. cinereus*, Temminck et Schlegel Fauna Japonica: Pisc. Tab. CXXXI. Fig. 1.

orbit, between the two dorsals, on the cheeks, throat and abdomen single short, longitudinal or oblique, ultramarine bands; the rest of the head and body with numerous distant rounded ultramarine spots; first and second dorsal spine, and their membrane, and the caudal rays yellowish olive, dotted with black; caudal membrane pale greenish white, densely dotted with brown and with four indistinct reddish brown bands, of which the anterior a little behind the root of the fin, the fourth on the posterior margin; rest of the fins hyaline. Iris golden bronze, orbital margin blackish.

D 2—46, C $10\frac{1}{1}$, A 49, P 14, Br. VI.

Habit.—*Sea of Pinang.*

Indian Ocean, Canary Islands, Carribean Sea, China Sea.

Total length: $9\frac{5}{8}$ inch.

The form is elongated lanceolate, broader at the tail than at the muzzle. The length of the head is contained $3\frac{2}{3}$ times in the total. The length of the head, from the chin to a little behind the orbit, is contained $3\frac{2}{3}$ times in the total. The eye is situated between the first dorsal spine and the upper extremity of the gill-opening, a little closer to the former than to the latter; the horizontal diameter is $\frac{1}{7}$ of the head. From the muzzle the profile gently ascends to the first dorsal spine, the corresponding profile, from the chin to the anus, describes a gently rising arch, so that the outline of the head is elongated conical with the point truncated. The horizontal distance between the eyes equals two diameters. The nostrils, lips, teeth and tongue resemble those organs of *A. obliteratus*. The upper extremity of the oblique linear gill-opening is situated in the middle between the centre of the lower orbital margin and the root of the pectorals; the lower extremity extends to a little in front of the orbit; the length equals the horizontal diameter of the eye. The first dorsal spine is slender and flexible and covered with granules like those of the body; its length is $\frac{1}{2}$ of its distance from the muzzle, which is contained $4\frac{1}{3}$ times in the total length. The membrane is small completely hiding the minute second dorsal spine. The groove of the back is $\frac{1}{2}$ of the length of the first spine which, however, does not sufficiently recline, so as to come in contact with the back. The interval between the two dorsals ascends gently backwards, and equals the distance from the muzzle to the anterior margin of the orbit. The posterior dorsal is low, the longest rays exceeding the horizontal

diameter of the eye by $\frac{1}{4}$; the extent of the base equals the distance from the muzzle to the first dorsal spine; the distance between the last dorsal and the root of the upper caudal ray equals the vertical diameter at the root of the caudal both are contained $2\frac{1}{3}$ times in the extent of the base of the posterior dorsal. The anus is situated opposite the third ray of the posterior dorsal; the anal commences opposite the 6th, and extends farther back than the opposite fin, which it otherwise resembles. The caudal is very large, broad oval; the central rays, the longest, equal the length of the head. The rounded pectorals slightly exceed the longest dorsal rays. The vertical diameters at the first dorsal spine and at the first dorsal ray, equal the distance between the spine and the muzzle; in the centre between the two dorsals the diameter equals the head. A single individual was observed at Pinang in December 1842. Shortly after death the body became shining blackish, a shade lighter than the blue marks, which changed to intense bluish black.

Alutarius barbatus, (Gray.)

Plate VIII. Fig. 1.

(Icon.) Balistes (Anacanthus) barbatus, Gray: Ill. Ind. Zool. I. Pl. 84, Fig. 2.

Anacanthus* barbatus, Gray: Zool. Miscell. 8.

Psilocephalus† barbatus, Swainson, II. 327.

* The following are Mr. Gray's characters: "Anacanthus. Body long, lanceolate, compressed, covered with small scales; head produced, beak-shaped, mouth small; under lip one bearded; pelvis produced, bag-like, with a single rather long spine in front; dorsal fin one, long; anal long; tail long, lanceolate; most allied to *Alutera (les Aluteres*, Cuv.).

"*Anacanthus barbatus*, Illust. Ind. Zool. Pisc. t. 1. f. 2. Brown, rather paler beneath; under part of the jaws, body and ventral pouch whitish, marbled with black lines; anal fin produced a little beyond the dorsal fin; tail nearly half as long as the body, D 46, V 11, A 60, P 8? Singapore." (Zool. Miscell. 1831, p. 8.)

Comparison of preserved specimens of this fish with the plate in the Illustr. of Ind. Zoology, leaves little doubt that the latter is an incorrect copy. The draughtsman has overlooked the anterior dorsal fin, and added a ventral spine and pouch. These two are the principal distinguishing characters of the Gen. *Anacanthus*. Both, however, are erroneous: the fish is a true *Alutarius*, and the genus *Anacanthus* is inadmissible.

† Psilocephalus, Swainson, 1839, is a second genus founded upon the figure of *Anacanthus barbatus* in Ill. Ind. Zool. It is thus doubly inadmissible being a synonyme of *Anacanthus*, and being founded upon erroneous characters.

Dark bluish green slate-coloured; filament of the chin black; spine of the anterior dorsal pale bluish green, membrane hyaline, minutely dotted with black; posterior dorsal, anal and pectorals transparent brownish white, rays pale yellowish brownish yellow; caudal rays yellow, membrane black. Pupil black, horizontally oval; iris silvery.

D $\begin{cases} 1—44, \\ 1—47, \\ 1—50, \\ 1—51, \end{cases}$ C $8\frac{2}{2}$, A $\begin{cases} 65, \\ 61, \\ 62, \\ 59, \end{cases}$ P 9, Br. VI.

Habit.—*Sea of Pinang, Singapore.*

Total length: $9\frac{6}{8}$ inch.

The form of the body is narrow, very elongated, resembling the blade of a knife; the sides compressed, the abdomen nearly trenchant. The head is very elongated, gradually attenuated towards the muzzle; its length from the chin to a little behind the orbit is $\frac{1}{5}$ of the total, or very little more or less. The eye occupies the commencement of the posterior fifth of the head: it is situated beneath the spine of the anterior dorsal, close to, without encroaching upon the profile; the horizontal diameter is $\frac{1}{9}$, rarely $\frac{1}{8}$ of the length of the head; the horizontal distance between the eyes is but $\frac{2}{3}$ of their diameter. The two apertures of each nostril are minute, tubular, opening side by side immediately in front of the anterior margin of the orbit. The lower jaw is longer than the upper, beyond which the rounded chin projects; the mouth is a small transversal cleft which opens vertically on the upper part of the muzzle; the lips are thin, membranous; the teeth, apparently 8 in the upper, 6 in the lower jaw, do not differ from those of the preceding species of *Alutarius*. To the chin is attached a vertical, soft, fleshy filament, tapering from the base into a sharp point, its length exceeds $\frac{1}{2}$ of the head. Between the branches of the lower jaw, from behind the filament to the lower extremity of the gill-opening, the skin of the throat is lax and forms a kind of narrow, slightly downwards arched dewlap. The floor of the mouth rises gradually towards the second third of the head, where the three very elongated branchial arches commence. The rest of the cavity is a very narrow tube which closely follows the gently backwards ascending profile of the forehead. No distinct tongue is visible. The gill-opening is linear, downwards arched, and very oblique; it commences beneath the anterior angle of the orbit, on a level with the root of the pectorals, the distance from which, as well as

the length of the opening itself, but slightly exceeds the horizontal diameter of the eye. The branchiostegous rays are setaceous. The pelvic spine is narrow like the blade of a sabre, and in six individuals examined, so completely hid in the integuments, as not even to encroach upon the abdominal profile which is very slightly arched. Nor did they offer the least trace of a triangular dewlap, as represented in the figure Hardwicke's Illustrations. The profile of the back rises but little and slowly from the muzzle to the posterior dorsal, from the termination of which it gently descends; the abdominal outline is but little more arched. The anterior dorsal consists of a single spine placed above the pupil, in front of the pectorals; it is very slender, setaceous, covered with minute spines; in all individuals observed, it reclined in its dorsal groove, but might readily be raised; the membranc is small triangular, apparently without a second spine. The distance between the dorsal spine and the posterior dorsal fin is by $\frac{1}{4}$ shorter than that between the spine and the chin. The upper margin of the posterior dorsal is a little arched; the rays towards the middle are the longest, and equal the length of the spine; the extent of the base exceeds by about $\frac{1}{6}$ the length of the head; the interval betwecn the last dorsal and the root of the upper caudal ray varies from a little less than $\frac{1}{2}$ of, to $2\frac{1}{3}$ times in the extent of the fin. The anal resembles the posterior dorsal, but it commences a little more forwards behind the anus, and is carried farther backwards, so that its extent at the base exceeds that of the former by $\frac{1}{4}$ or $\frac{1}{5}$, while its distance from the caudal is $\frac{1}{3}$ less than that of the former. The caudal is very elongated, lanceolate; the two upper and lower rays are, like those of the other fins, undivided; the margins of all rays have a series of microscopic spines. On each side of the root of the caudal appears a triangular pointed space, covered with minute hair-like spines, like the rest of the body. The length of the central rays vary in the different individuals from $2\frac{2}{3}$ times in, to $\frac{1}{3}$ of the total. The upper rays of the pectorals, the longest, slightly exceed $\frac{1}{4}$ of the length of the head. The body is covered with little rounded scales and has a fine velvety appearance from its being densely covered with minute, microscopic spines. The lateral line is so fine that it is hardly visible to the naked eye. Behind the orbit, at its origin, it sends two branches round the orbit, of which the upper one accompanies the pro-

file to the muzzle, the lower ascends to a little in front of the eye and then proceeds parallel to the upper branch. The main trunk at first ascends obliquely, but soon descends with 3 to 4 short undulations to a little in front of the posterior dorsal, from whence it continues in the middle of the side and terminates at the apex of the scaly part of the caudal. The vertical diameter at the upper lips slightly exceeds $\frac{1}{7}$ of the length of the head; at the dorsal spine it is a little less than $\frac{1}{4}$; the greatest, between the two dorsals is $\frac{1}{3}$; at the root of the caudal it is a little less than $\frac{1}{6}$ of the head. The greatest horizontal diameter, or thickness of the body, is a little behind the anterior dorsal fin, where it equals $1\frac{2}{3}$ diameters of the eye; from thence it gradually decreases and becomes trenchant towards the tail like the entire abdominal part of the fish. A single mutilated individual was observed at Singapore in May 1843; five others, of which the smallest measured 8 inches in length, occurred at Pinang in the following November, in February and August and December 1844, and in June 1845. After death the colour of the body changes to a dusty pale reddish brown, dotted with black, the caudal membrane turns pale bluish grey; the arched lax skin of the throat shrivels up, so as scarcely to be visible.

Gen. Triacanthus, *Cuvier*, 1817.

With a kind of ventrals, each supported by a single large spinous ray, adhering to a not salient pelvis; anterior dorsal with three or four small spines behind a very large one; skin covered with crowded small scales; tail longer than in the other sub-genera.

Triacanthus biaculeatus, (Bloch.)

Balistes biaculeatus, Bloch, Tab. 148, Fig. 2.
Russell, XXI. Bowree, or Abatoo.
Balistes biaculeatus, Shaw, V. 415, Pl. 169.
Triacanthus biaculeatus, Cuv. R. A. II. 374 (5).
Triacanthus biaculeatus, Bennett: Life of Raffles, 693.
Balistes biaculeatus, Bennett: Fishes of Ceylon, No. 15, *(Young.)*
Triacanthus biaculeatus, Swainson, II. 326.
Triacanthus biaculeatus, Richardson: Rep. 1845, 202.
Triacanthus biaculeatus, Bleeker: Verh. Batav. Gen. XXII. 6.

Head above and back pale blackish green, lighter on the sides above the lateral line; rest of the sides of body and head and abdomen frosted silvery; in some a faint blackish spot a little below the eye; first dorsal spine silvery blackish, the rest white; the basal half of the spines as well as the yellowish membrane black; ventral spines silvery white; rest of the fins pale yellowish, in some the margins blackish. Iris pale golden, bluish black towards the orbit.

D 5—24 or 25, C 14$\frac{1}{1}$, A 19 or 20, V 1, P 14, Br. VI.

Habit.—*Sea of Malayan Peninsula and Islands,*

Indian Ocean, Ceylon, Bay of Bengal, Sumatra, Java, Borneo, Madura, Sumbawa, Celebes, Seas of China and Australia.

Total length: 9 inch.

The form is trapezoid, approaching the rhomboidal. The head is broad, pyramidal, tapering to an elongated muzzle; the length from the latter to the gill-opening varies from $\frac{1}{4}$ of to 4$\frac{1}{2}$ times in the total. The eye borders upon the profile; the anterior margin of the orbit is situated opposite the commencement of the posterior third of the head; the oblique diameter is $\frac{1}{4}$ of the length of the head; the distance of the eyes between the anterior angles equals the diameter, between the posterior angles it is $\frac{2}{3}$ more. The two tubular apertures of each nostril are placed obliquely in front of the eye upon the profile; the upper aperture is oval, larger than the lower, rounded one. The small mouth is surrounded by thick fleshy lips; each jaw has an external series of 10 trenchant teeth, of which the central ones are the largest; in the upper jaw appears a second transversal series of four tubercular teeth, of which the central pair are the larger; in the lower the corresponding series consists but of two tubercular teeth, immediately behind the pair on the symphysis. The tongue is small, fleshy, oval and tied to the floor of the cavity. The gill-opening is linear, slightly oblique, situated immediately in front of the pectorals; the length nearly equals the diameter of the eye. The distance from the muzzle to the root of the first dorsal spine varies from $\frac{1}{3}$ of to 3$\frac{1}{3}$ times in the total length. The spine is strong, covered to the apex with small bipartite or tripartite spines; in young individuals its length equals the greatest vertical diameter of the body, in older ones it is $\frac{1}{4}$ to $\frac{1}{3}$ less. The second spine is much shorter, slenderer, and but slightly rough on the posterior margins; its length varies from

$\frac{1}{5}$ to $\frac{1}{7}$ of the former; the succeeding rays gradually decrease in length, the last one varying from $\frac{1}{3}$ to $\frac{1}{2}$ of the second; the connecting membrane is a little shorter than the spines; the extent of the anterior dorsal slightly exceeds $\frac{1}{2}$ of the distance from the first spine to the first ray of the posterior dorsal, which varies from $\frac{1}{6}$ of to $5\frac{1}{2}$ times in the total length. The posterior dorsal is low, gradually rising from the first, undivided, ray to the sixth, and then slowly decreasing; the longest ray is $1\frac{2}{3}$ diameter of the eye; the extent of the fin nearly equals the length of the head; the distance from the root of the upper ray of the caudal varies from $\frac{3}{4}$ to $\frac{7}{8}$ of the extent. The anal is falcated; it commences opposite the 9th or 10th ray of the posterior dorsal, and terminates opposite the last ray; the first ray is undivided, $\frac{1}{2}$ of the second, the longest, which varies from $1\frac{1}{2}$ to 2 diameters of the eye; the succeeding rays suddenly decrease to the 11th or 12th, from whence the remaining rays are but $\frac{1}{4}$ of the longest. The anus is situated immediately in front of the fin. The caudal is deeply divided in two pointed, or a little rounded lobes, of which the upper one is generally the longer, equalling the extent of the posterior dorsal. The pectorals are rounded, their length varying from $1\frac{3}{4}$ to two diameters of the eye; they are placed immediately behind the gill-opening, opposite the first dorsal and the ventral spines, but nearer the latter. These spines are as strong, and rough as the first dorsal, but shorter, their length varying from $\frac{4}{5}$ to a little more than $\frac{1}{2}$ of the head; each is attached by a short thick rough membrane to its respective groove on each side of the very elongated, flattened pelvic spine, which is covered with little scales, not different from those of the rest of the body. The latter are very small, subrhomboidal with the vertical diameter much longer than the horizontal. Each scale (Plate IX. Fig. 3. Magnified.) carries a single vertically placed crest, which is armed with from 4 to 15 excessively minute spines. The skin is rough to the touch in every direction. The hair-like lateral line commences behind the orbit, describing a wide arch which terminates opposite the posterior third of the posterior dorsal, from whence it proceeds in the middle of the side of the tail to the caudal. At its origin the line gives off the following branches; a vertical, anastomosing in front of the dorsal spine with the one from the opposite side; a second along the supraorbital margin, in front of the nostril, along the profile to the muzzle; a third along the infraorbital margin, obliquely undulating over

the cheek; a little behind the mouth it suddenly ascends to join the opposite corresponding branch; a fourth descends a little in front of the gill-opening, beneath which it forms a short arch backwards, and then proceeds obliquely downwards to the middle of the ventral groove. At Pinang and at the Sandheads young individuals are excessively numerous at all seasons; larger ones are rarely seen, particularly in the latter locality.

TRIACANTHUS STRIGILIFER, Cantor.

Plate IX. Fig. 1 and 2.

(*Young?*) Head above and back pale sea-green, changing to bluish white on the upper half of the sides; lower half and abdomen frosted silvery white; back and sides with a few orange spots of irregular form, viz. an elongated spot between the eyes towards the nostrils; a second, broad rhomboidal surrounding the base of the anterior dorsal, and sending a vertical branch, with rugged margins, down to the gill-opening; a third oblique spot from the third to the eleventh ray of the posterior dorsal; immediately behind the mouth a vertically placed pair of small spots; a pair of larger ones, of which the lower like a horse-shoe, on the cheek beneath the nostril; beneath the eye a horizontal band to the lower part of the gill-opening; in the axilla a short horizontal band, giving off an irregular branch towards and above the anal, and a longer arched one to opposite the middle of the posterior dorsal; at a short interval another horizontal band terminating in the middle of the side, a little behind the posterior dorsal; in the centre of the base of the caudal a small rounded spot; on the posterior half of the tail a broad forwards pointed spot of bright yellowish green; first spine of anterior dorsal pale sea-green, minutely dotted with black; the succeeding spines white; membrane hyaline, minutely dotted and edged with black; pectorals and ventral spines white; rays of the rest of the fins yellowish white, membranes hyaline. Pupil horizontally oval, black; iris light yellow golden, orbital margin greenish black.

D 5—22, C $12\frac{1}{1}$, A 16, V 1, P 13, Br. VI.

HABIT.—*Sea of Pinang,*

TOTAL LENGTH: $6\frac{4}{8}$ inch.

This species differs from the preceding by its more elongated, less deep form, by its larger eye, its peculiar scales, its longer second dorsal

spine, its number of finrays and colours. From the muzzle to the lower angle of the gill-opening the head is $\frac{1}{4}$ of the total length. The eye borders upon the profile, occupying the posterior third of the length of the head, of which the horizontal diameter is $\frac{1}{3}$; the distance between the anterior angles of the eye equals the diameter; that between the posterior ones is $\frac{1}{4}$ longer. The nostrils, lips, teeth and tongue resemble those organs of *T. biaculeatus*, but the gill-opening is proportionally shorter, being but $\frac{2}{3}$ of the diameter of the eye. The distance from the muzzle to the first dorsal spine is a little less than $\frac{1}{3}$ of the total length. The spine resembles that of *T. biaculeatus*, equalling the greatest vertical diameter of the body. The second spine is remarkably long, $\frac{1}{2}$ of the former, and the length of the connecting membrane corresponds; the extent of the fin, and its distance from the posterior dorsal are the same in both species. The longest ray of the posterior dorsal is proportionally shorter, being $\frac{2}{3}$ of the diameter of the eye, but its distance from the caudal is greater: it equals the extent of the base, which is $\frac{5}{6}$ of the length of the head. The falcated anal commences opposite the 12th ray of the posterior dorsal, and terminates opposite the last ray; the longest ray slightly exceeds the diameter of the eye; the extent of the base is proportionally shorter than in *T. biaculeatus*. The caudal is less deeply cleft almost crescent-shaped; the lobes equal; their length is contained $4\frac{1}{2}$ times in the base of the posterior dorsal. The pectorals are rounded, their length slightly exceeding the diameter of the eye. The ventral spines resemble those of *T. biaculeatus;* but the intermediate pelvic spine is in the present proportionally longer, and covered with larger scales, entirely different from those of the rest of the body; their form is hexagonal with excessively minute spinous crests radiating to the margins. The scales of the body (Plate IX. Fig. 2. Magnified), although small, are perceptibly larger than in *biaculeatus*, and with their horizontal diameter longer than the vertical; their form is nearly rhombic with from three to seven vertical or oblique crests, each of which is armed with three to seven excessively minute spines. Each scale thus resembles a small curry-comb, which makes the skin in every direction rough to the touch. The main trunk of the lateral line resembles that of *biaculeatus*, but it gives off an additional vertical branch to the middle of the root of the first dorsal spine, a little behind the anterior anastomosing one. The

two branches surrounding the eye can be traced no farther than the region of the nostrils; and the one in front of the gill-opening appears to terminate at the lower angle of the opening. A solitary individual occurred at Pinang in June 1845. Several years before, the existence of a second species of *Triacanthus* was positively asserted by fishermen who described it as being very rarely seen, and of a size somewhat smaller than *T. biaculeatus*.

FAM. OSTRACIOIDÆ.

Gen. Ostracium, (*Linné*, 1748) *Cuvier*, 1817.

Head and body covered with bony, regular plates, instead of scales, soldered so as to form a kind of inflexible armour; the tail, fins, mouth and a kind of small lip covering the margin of the gill-opening are the only moveable parts, all passing through holes in the armour, also the greater number of vertebræ are soldered together; each jaw with 10 to 12 conical teeth; ventral fins and pelvis none; dorsal and anal small; branchiostegous rays six.

Ostracium cornutum, Linné.

Ostracion cornutus, Linné: Mus. Ad. Fr. I. 59.
Ostracion cornutus, Linné: Syst. 1443.
Ostracion cornutus, Bloch. Tab. 133.
Ostracion cornutus, Bloch-Schneider, 500.
Ostracion cornutus, Shaw, V. 423, Pl. 170.
Ostracion cornutus, Cuv. R. A. (I. Ed.) II. 154 (⁶).
Ostracion cornutus, Bennett: Life of Raffles, 693.
Lactophrys* cornutus, Swainson, II. 324.
Ostracion cornutus, Richardson, Report, 1845, 200.
Ostracion cornutus, Temm. et Schl. Fauna. Jap. Pisces, Tab. CXXXI. Fig. 4, *(Young.)*

Buntal kumbang of the Malays.

* *Lactophrys*, Swainson, 1839. In *Nomenclator Zoologicus*, *Pisces*, p. 33, this Sub-Genus is by mistake written *Laetophrys*, while in *Addenda*, p. 3, *Lactophrys*, De Kay, 1842, is quoted as a distinct genus. In the Zoology of New York, III. 341, *Lactophrys* is quoted with the evidently accidental omission of the name of the founder, but the characters are those of Mr. Swainson. (*Nat. Hist. of Fishes*, &c. II. 324.)

Young. (Without spines; 1 inch in length.) Upper surface and sides pale greenish yellow, with a sky-blue central spot in some of the hexagons, and here and there with a single brown spot; abdomen light reddish yellow; generally with a single brown spot on the throat, and one or two on the anterior part of the lateral margin; fins hyaline.

Older. Upper surface and sides pale greenish olive, minutely dotted with black, with a central sky-blue spot in each hexagon; abdomen yellowish white; fins transparent pale olive; caudal minutely dotted with black; posterior half blackish; spines buff, minutely dotted with black. Iris bright yellow, orbital margin orange or red; pupil obliquely oval, irridescent black.

D 9, C $8\frac{1}{1}$, A 9, P 11, Br. VI.

Habit.—*Sea of Malayan Peninsula and Islands.*

Chinese Seas, Canton, Japan.

Total length: 6 inch.

The form of the body is tetragonal, with the lower surface broader than the upper, and the sides concave. The length of the head is $\frac{1}{4}$ of the total. The forehead is at a nearly right angle with the vertex; the vertical diameter through the eye, the greatest of the body, is contained $3\frac{1}{2}$ times in the total length; that through the gill-opening is a little shorter; at the termination of the armour it is $5\frac{1}{2}$ times in the total length. The eye is situated close to the frontal angle; the greatest oblique diameter is $\frac{1}{2}$ of the length of the head. Above each eye rises a subular, forwards, upwards and outwards directed spine, granulated at the base; the rest finely fluted; the length equals the head. The distance between the eyes across the vertex is excavated, a little less than two diameters. The nostrils have two minute, apparently papillular apertures, placed in a small, nearly vertical furrow close to the anterior angle of the eye. A little in front of the lower aperture appears a minute papilla. Each jaw has a single series of ten small conical teeth, almost entirely hid by the fleshy lips; the teeth are of a dark amber or chestnut brown; the four above the symphysis of the lower jaw are a little longer than the rest. The mouth is very small; the tongue is minute, fleshy and completely tied to the floor of the mouth; behind the tongue there is a small raised step, leading into a tunnel, on each side supported by the four branchial arches. The sides of the back are angular, a little contracted in the middle. A little in front of the dorsal, at the

widest part of the back, appears on each side a small pointed tubercle, between which the distance equals the length of the head. The centre of the back is raised, so as to form a linear sharp keel which terminates in a small pointed tubercle in the middle between the two lateral ones. The abdominal surface is both longitudinally and transversely arched; the greatest transversal diameter, about the middle, is contained $2\frac{2}{3}$ times in the total length. On each side of the termination appears a spine resembling the frontal ones, but pointed in an opposite direction and a little shorter. The armour is composed of pentagonal, hexagonal or heptagonal pieces with the margins finely toothed or ciliated. The pieces of the back and sides have each a tubercle in their centre, from which radiate a number of lines corresponding to the respective number of sides. On the pieces of the abdomen appear instead of lines a number of minute hemispherical tubercles. The dorsal fin is placed at a short distance from the termination of the armour above; its length is $\frac{1}{2}$ of the head; the extent of the base is $\frac{1}{2}$ of the length. The length of the small naked tail is contained about $2\frac{1}{2}$ times in the elongated oval caudal fin. The rounded anal is situated above, yet between the posterior pair of spines, behind the dorsal which it resembles. The rounded pectorals are nearly $\frac{3}{4}$ of the length of the head. The smallest individuals examined measured 1 inch in length. They had no spines, but in their places appeared tubercles. The central and lateral tubercles of the back were comparatively more developed than in the adult. In the middle of the upper pupillary margin of the iris appeared a small notch. The smallest ones, provided with blunted spines half the length of the head, measured $1\frac{4}{8}$ inch in length. Young individuals are at Pinang numerous at all seasons.

Ostracium tesserula, Cantor.

Plate VIII. Fig. 2 and 3.

Young. Armour bright gamboge with numerous small black spots, not corresponding to the centre of the polygons, and fewer and more distant on the abdomen; tail bright gamboge with one or two black dots on each side of the root of the caudal; fins gamboge, a little paler than the body; pectorals with a single black dot at the root; caudal with the posterior margin pale blackish. Pupil transversely oval, black;

iris bright gamboge, orbital margin orange; in the middle of the upper pupillary margin a small notch.

D 9, C $8\frac{1}{1}$, A 9, Br. VI.

Habit.—*Sea of Pinang.*

Total length: 2 inch.

The general form is tetragonal. The back is elongated oval, arched from the occiput to the tail; in the centre appears a short longitudinal crest, on each side of which is a deep furrow, laterally bounded by the sharp angular margin. By these three crests the vertical section in this particular region becomes pentagonal. The profile of the forehead is nearly straight and steep. The distance between the anterior angles of the orbits is $\frac{1}{4}$ of the total length; the greatest breadth in the middle of the back is contained $2\frac{2}{3}$ times in; above the naked tail it is $\frac{1}{11}$ of the total length. The abdominal surface is both longitudinally and transversely arched, with a furrow along the angular margin; it is broader than the back, its greatest breadth, beneath the pectorals, varies from $1\frac{2}{3}$ in to $\frac{1}{2}$ of the total length. The sides are excavated with the lower margin projecting farther outwards than the upper; their greatest diameter is nearly in the middle and is contained $2\frac{1}{2}$ times in the total length; but the vertical diameter of the central crest of the back is a little longer, owing to the central convexity of the abdomen. The armour is composed of hexagonal pieces with very finely toothed or ciliated margins. From the centre of each hexagon radiate towards the margins six raised lines of which the central, horizontal ones, join their neighbours, so as to form on the sides of the armour seven parallel, horizontally arched, lines, which form the bases of triangles produced by the other obliquely radiating lines. On the back and sides the triangles are very conspicuous, while the hexagonal outline of the component pieces can scarcely be traced. On the abdominal surface the reverse is the case. From the central tubercle radiate numerous fine lines; but the triangles are very indistinct. The length of the head is contained a little less than $3\frac{1}{2}$ times in the total. The eye is situated close to the profile, nearly in the middle between the gill-opening and the muzzle; the horizontal diameter is $\frac{1}{3}$ of the length of the head. The supraorbital arch forms a tubercular protuberance. The mouth, teeth, and tongue and nostrils resemble those of *O. cornutum*, but there appears to be no nasal papilla. The dorsal is placed close to the termination of the armour; the

upper margin slopes backwards; the anterior ray, the longest, is $\frac{1}{2}$ of the length of the head, of which the extent of the base is $\frac{1}{4}$. The anal is but little farther backwards than the dorsal, opposite the middle of which is placed the first ray; in form and length it resembles the dorsal. The caudal is elongated oval; its length $\frac{2}{3}$ of the head. The pectoral is broad, nearly triangular; the third ray, the longest, equals the caudal. This fish is of rare occurrence at Pinang. Of four individuals observed at irregular intervals, the length varied from 2 to 1 inch. They appear to be young individuals. The triangular partitions of the armour characterise *O. turritum*,* Forskål. Possibly the present fish may be the young of that species, prior to the appearance of the spines and the full development of the dorsal crest.

Ostracium nasus, Bloch.

Ostracion nasus, Bloch, Tab. 138.

Ostracion nasus, Shaw, V. 426, Pl. 171.

Ostracion nasus, Cuvier, R. A. Ed. 1, II. 154 (⁵).

Ostracion nasus, Swainson, II. 323.

Búntal pánjang of the Malays.

Upper surface pale brownish- or greenish olive, with numerous small rounded dark brown spots; sides lighter of either colour; in some the margins of the polygons dark brown; abdomen either uniformly buff with the margins of the polygons pale lilac, or pale reddish yellow with the nuclei of the polygons greenish white; the naked tail brownish olive, lighter on the sides, with numerous brown spots; beneath greenish buff; lips, margin of gill-openings and root of pectorals pale greenish olive with few brown spots; fins pale transparent greenish olive; a round brown spot at the root of each dorsal ray, and a few similar scattered over some of the caudal rays. Orbital half of iris pale greenish olive with few brown spots, rest bright yellow with a blackish or orange ring; pupil black, circular.

Young. With a few rounded brown spots irregularly scattered over the sides.

* Syn. *Ostracion turritus*, Forsk. 5. 7, No. 113;—Bloch. Tab. 136;—Shaw, V. 425, Tab. 171;—Cuv. R. A. Ed. 1, II. 154;—Rüppell: Atlas, 5, and Neue Wirb. Fische, 61;—*Tetrasomus turritus*, Swainson, II. 323.

D 9, C $8\frac{1}{1}$, A 9, P 11, Br. VI.

Habit.—*Sea of Pinang, Malayan Peninsula.*

"Indian and American Seas," (Bloch.)

Total length: $7\frac{4}{8}$ inch.

The form is nearly quadrangular, as the breadth of the abdomen but slightly exceeds that of the back and the height of the sides. The back is elongated lanceolate; from the nasal protuberance the profile gently ascends towards the middle of the back, when it slowly descends towards the tail, the whole forming a very low arch. From the occiput to near the dorsal the middle of the back is raised and forms a low triangular keel, on each side of which appears a shallow broad sulcus, outside bordered by the raised angular margin of the side. The triangular forehead slopes gently from the occiput and appears a little excavated owing to the broad protuberant supraorbital margins. The breadth between the anterior angles of the orbit is $\frac{2}{3}$ of the length of the head; between the posterior angles it equals the head; the greatest breadth, in the middle of the back, exceeds the length of the head by $\frac{1}{4}$, $\frac{1}{5}$ or $\frac{1}{6}$, according to the individually more or less projecting nasal protuberance; the breadth at the termination of the armour is a little less than half the breadth between the posterior orbital angles. The nasal protuberance is blunt, rounded. In individuals $6\frac{4}{8}$ inch in length it scarcely projects beyond the mouth, immediately above which the profile rises vertically, and this portion measures $\frac{1}{2}$ of the distance between the anterior angle of the orbit and the protuberance, which in them is $\frac{1}{9}$ of the total length. In the largest individual, $7\frac{4}{8}$ inch in length, the protuberance perceptibly projects beyond the mouth, from which the profile projects obliquely and exceeds $\frac{1}{2}$ of the stated distance, which is $\frac{1}{8}$ of the total length. The sides are but little excavated; their greatest vertical diameter corresponds to, but slightly exceeds, the greatest breadth of the back; it varies from $4\frac{1}{6}$ to $4\frac{1}{7}$ times in the total length. The length of the head, from the nasal protuberance to the gill-opening, is in younger individuals, with the protuberance but little developed, $\frac{1}{5}$ of the total, in older ones it is contained $4\frac{1}{2}$ times in the total. The eye is close to the profile; the posterior angle of the orbit is situated above the gill-opening. The greatest diameter is a little oblique, ascending backwards; it is contained $2\frac{1}{2}$ times in the distance from the mouth to the gill-opening, and this proportion appears to be constant. But as the development of the

nasal protuberance increases with age, so does the relative length of the diameter of the eye vary from $2\frac{1}{2}$ times in to $\frac{1}{3}$ of the distance, measured from the protuberance to the gill-opening. The nostrils, mouth and tongue resemble those of *O. tesserula*. Each jaw carries a single close series of from 9 to 11 conical teeth of a chestnut or brown colour. The six central teeth of both jaws are a little larger than the rest and their points become blunted with age. The armour is composed of pentagons, hexagons and heptagons, with ciliated margins. Not including the lateral half-series, on the back and sides appear five longitudinal ones; nine pieces from the gill-opening to the tail. The abdomen is covered by nine longitudinal series of which the central one is composed of 12 to 14 pieces. All are closely covered with minute bony tubercles, generally arranged parallel to the margins. The dorsal commences opposite the anus; the upper margin is rounded; the third and fourth ray, the longest, slightly exceed $\frac{1}{2}$ of the length of the head; the extent of the base is $\frac{1}{2}$ of the length. The anal commences opposite the last ray of the dorsal, which it in form and length resembles. The caudal is broad triangular with the posterior angles and margin rounded; the two central rays, the longest, equal the head. The pectorals are broad triangular; the third and fourth upper rays are the longest, $\frac{2}{3}$ of the length of the caudal. The length of the sides of the naked tail is $\frac{3}{4}$ of the caudal. Single individuals, or two or three together, were observed at Pinang at long and irregular intervals. In size they differed but slightly, the smallest being $6\frac{3}{8}$ inch in length.

FAM. GYMNODONTIDÆ.

Gen. Diodon, *Linné*, 1766.

All the teeth united into a single one in each jaw; behind the trenchant margin of each a rounded part, transversely furrowed and forming a powerful apparatus of mastication; the skin armed with stout spines; no ventral fins.

Diodon triedricus, Cuvier.

Seba, II. XXIII. 4.
Diodon triedricus, Cuvier: Mém. du Mus. IV. 133.
Diodon triedricus, Cuv. R. A. II. 367 (*).

Head above, back and sides to a little below the gill-opening pale tortoise-shell brown; a transversal band composed of a large soot-coloured spot behind each pectoral, and a series of smaller spots across the back; a second similar but paler band in front of the dorsal; rest of the sides and abdomen yellowish white; fins whitish grey, minutely dotted with brown; all spines brown; their roots of the colour of the part they occupy. *(From a preserved specimen.)*

D 12, C 9, A ? P 19, Br. ?*

Habit.—*Sea of Pinang.*

Total length: 6 inch.

All the spines are compressed with the anterior margin convex, sharp and continued over the anterior, horizontally forwards directed root. The two posterior roots are placed at nearly right angles with the anterior. The roots are generally longer than the spines of which the longest appear on the sides of the back and body. Two longitudinal series of spines of the mesial line of the back, and three of the abdomen are shorter than the rest. There are three spines above the upper half of the orbit, three at the lower, and one at the angle of the mouth. The throat is naked with a single small bony protuberance beneath the symphysis of the lower jaw. Between the eyes appear three spines, viz. a central and the anterior one of the three supraorbital; between the pectorals across the back appear four spines. The upper part of the back carries four longitudinal series, viz. two central, each of eight, both terminating with an odd spine at a little distance in front of the dorsal fin, and two lateral series each of five spines, of which the anterior commences a little behind the pectoral fins, the posterior is situated between the dorsal and the caudal. This fish is of very rare occurrence at Pinang. The only one observed was a specimen which on account of its rarity had been kept preserved for several years, and was thus rendered unserviceable for more minute examination.

Gen. Tetrodon, *Linné*, 1766.

The jaws divided in the centre by a suture, so as to present the appearance of four teeth: two above and two beneath; the skin armed with small, slightly projecting spines; ventrals none.

* In *Mém. du Mus.* IV, Cuvier gives six, in *Règne Animal* five branchiostegous rays.

I.* *Species with short head, capable of inflating themselves so as to attain a globular form.*

Entire body rough.

A. *Immaculate.*

TETRODON IMMACULATUS, Lacépède.

Lacepède, I. XXIV. 1.

Russell, XXVI. Kappa.

Tetrodon immaculatus, Cuv. R. A. II. 368 (¹).

Young. Head above and back pale greyish olive, lighter on the sides of the head and upper part of the body; abdomen pale yellow ochre; axilla and the smooth spot inside the pectorals blackish; the whole body minutely dotted with brown; spines white, those of the back with black points; pectorals, anal and dorsal pale transparent olive, base of the latter blackish; caudal pale brownish with single indistinct whitish spots; upper, lower and posterior margin black. Iris olive.

D 10, C $9\frac{1}{1}$, A 9, P 17, Br. V.

HABIT.—*Sea of Pinang.*

Madras.

TOTAL LENGTH: $3\frac{5}{8}$ inch.

The length of the head, measured to the margin of the gill-opening, is contained $4\frac{1}{4}$ times in the total. The eye, bordering on the profile, is situated a little nearer the gill-opening than the muzzle; the horizontal diameter is $\frac{1}{5}$ of the head; the distance across the forehead is a little less than 2 diameters. The double, contiguous nostrils are situated in front of the eyes; each aperture is pierced through a small papilla, and both appear like a minute simple tentacle. The jaws are nearly equal, the four teeth normal; the tongue is globular, fleshy, tied to the floor of the mouth. The dorsal is fan-shaped; the first, undivided, ray is situated a little behind the commencement of the posterior third of the back, the caudal not included; the extent of the base is $\frac{1}{4}$ of the head, of which the longest ray is $\frac{1}{3}$. The first anal ray is situated behind the dorsal, at the commencement of the posterior fifth of the body; in shape and dimensions it resembles the dorsal. The caudal is broad

* Cuvier: *Règne Animal*, II. 368 (¹).

with the posterior margin rounded; its length equals the head. The pectorals are broad and rounded, $\frac{1}{3}$ of the length of the head. The lips, the throat, the space in front of the eyes, and that covered by the pectorals, and the tail from midway behind the dorsal, obliquely down a little in front of the anal, are all naked and smooth. The rest of the body is covered with crowded fine hair-like spines. A solitary young individual was observed at Pinang in September 1844. Russell observed but the mutilated specimen, which he described and figured.

B. *With black spots.*

Tetrodon simulans, Cantor.

Head above and back light yellowish or greenish olive, paler on the upper half of the sides of head and body; head, back and sides with numerous rounded, irregular or confluent spots, blackish brown or olive or black; throat and abdomen white, sparingly dotted with brown; spines white, fins pale olive, transparent, minutely dotted with black; anterior half of caudal with three or four more or less distinct backwards arched blackish bands, posterior half blackish. Iris bright yellow dotted with black.

D 12 or 13, C $8\frac{2}{3}$, A 10 or 11, P 19 or 21, Br. V.

Hahit.—*Sea and estuaries of Pinang, Malayan Peninsula, Singapore.*

Total length: 1 foot.

The length of the head is contained $3\frac{1}{4}$ times in the total. The eye is situated in the middle of the head, bordering on the profile; the horizontal diameter is contained $5\frac{1}{2}$ times in the length of the head; the distance between the anterior angles of the orbits is 2 diameters; between the posterior angles $2\frac{1}{2}$ such. There are no nostrils, but close in front of the anterior angle of the orbit appears a flattened simple tentacle. The upper jaw slightly projects beyond the lower; the tongue resembles that of *T. immaculatus*. The rounded dorsal fin occupies the commencement of the posterior fourth of the back; the three first rays are undivided; the fifth and sixth are the longest, $\frac{1}{3}$ of the head, and equal the extent of the base. The anal is placed opposite the dorsal, which it resembles, but the extent of the base is a little shorter, and but the two first rays are divided. The caudal is broad, with the upper, lower and posterior

margins convex; its length is $\frac{2}{3}$ of the head. The pectorals are broad, rounded; their length equals that of the dorsal. There is no lateral line. The spines are rather long, fine and somewhat distant; above they extend from between the eyes to near the dorsal; beneath from behind the throat to near the anus, which is situated a little in front of the anal. Young individuals of this species are at all seasons excessively numerous on the Malayan coasts. In general form and in distribution of colours it bears a striking resemblance to *T. fluviatilis*, Buchanan Hamilton,* which latter differs in having distinct simple nostrils, in number of fin rays and other characters. The present belongs to the Sub-Gen. *Arothron*, Müller.†

C. *With black bands.*

TETRODON CARDUUS, Cantor.

Head above and back dark yellow ochre with a number of longitudinal, slightly serpentine black lines continued to the caudal; sides of the head pale ochre with irregular black spots; sides of the body pale lilac whitish with a few distant black spots, disposed so as to form 4 or 5 vertical series; abdomen very pale ochre; dorsal and ventral, pale transparent olive, minutely dotted with black; caudal rays reddish yellow, membrane whitish dotted with black, and with vermicular black spots; pectorals pale yellow, with a blackish narrow band along the base. Iris orange dotted with black.

D 11, C $9\frac{1}{1}$, A 10, P 17, Br. V.

HABIT.—*Sea of Pinang.*

TOTAL LENGTH: 6 inch.

The length of the head is contained $3\frac{1}{2}$ times in the total. The eye is situated nearly in the centre of the length of the head, bordering upon the profile; the horizontal diameter is $\frac{1}{7}$ of the head; the distance between the anterior angle of the orbits is nearly three diameters; between the posterior four. No nostrils appear, but their place is supplied by two small black tentacles, the one close above the other. The jaws are nearly

* *Fishes of the Ganges* 6,361. Pl. XXX. Fig. 1.—*T. fluviatilis*, Cuv. R. A. II. 368 (1).

† AROTHRON, *Müller:* "On each side a solid tentacle containing the large olfactorian nerve; an annular muscle round the eye, and a kind of eyelid." (*Abh. Berlin. Akad.* 1839, 252 (1). Berlin 1841.)

equal, the teeth and tongue normal. The dorsal occupies the commencement of the posterior fifth of the back; it is fan-shaped, with the first ray undivided; the longest rays are $\frac{1}{3}$ of the head, or twice the extent of the base of the fin. The posterior margin of the caudal is convex; the longest rays are $\frac{1}{3}$ of the head. The anal resembles the dorsal; it commences, nearly opposite the middle of the distance between the dorsal and the caudal. The pectorals are rounded, their length equals that of the dorsal. The spines are rather long, very fine, hair-like and crowded. On the back they commence from between the nasal tentacula and extend to the caudal, in front of the base of which there is but a small naked space. The lips, the chin and the space inside the pectorals are also spineless. A single individual was observed at Pinang in December 1842. This species is nearly allied to *T. virgatus*, Richardson, (*Zool. Erebus and Terror*, 62, Pl. XXXIX. Fig. 8-9,) from which it differs in the dorsal being situated farther back; in the relative position of the latter fin and the anal, and in the greater number of black lines of the back. In the present the latter are twelve; in *T. virgatus* six. It is also allied to *T. meleagris*, Solander.*

D. *With pale spots.*

TETRODON TESTUDINEUS, Linné.

Tetrodon testudineus, Linné: Amoen. Acad. I. 309, Tab. 14, Fig. 3.

Tetrodon testudineus, Linné, Syst. 1444.

Tetrodon testudineus, Bloch. Tab. 139.

Tetrodon testudineus, Shaw, V. 444, Pl. 178.

Tetrodon testudineus, Cuvier, R. A. II. 368 (').

Tetrodon testudineus, Swainson, II. 328.

Young. Head above, back and upper part of the sides reddish brown with numerous rounded and elongated milk-white spots, minutely dotted with brown; rest of the sides and abdomen reddish yellow with a number of brown parallel bands, downwards arched and increasing in length, interrupted, or two joined, towards the tail; caudal dark brown with numerous whitish spots; rest of the fins yellowish, transparent, blackish at the base. Iris reddish yellow dotted with black.

D 10, C $8\frac{1}{2}$, A 10, P 15, Br. V.

* Syn. Lacép. I. 505.—Bl. Schn. 507.—*T. meleagris*, Richardson: *Ichth. Sulph.* 122, Pl. 57 Fig. 1-3, and *Voy. Samarang* p. 19.

Habit.—*Sea of Pinang.*

Indian Ocean.

Total length: $3\frac{2}{8}$ inch.

The length of the head is contained $3\frac{1}{2}$ times in the total. The eye, bordering on the profile, is a little nearer the muzzle than the gill-opening; its greater diameter, rising obliquely backwards, is $\frac{1}{5}$ of the length of the head; the distance between the anterior angles is two such diameters; three between the posterior. The nostrils have two small apertures, between which rises a small tentacle. The teeth and tongue are normal. The rounded dorsal is situated between the penultimate and posterior fourths of the back; the two first rays are undivided, the fifth and sixth, the longest, are contained $2\frac{1}{2}$ times in the length of the head, and they equal the extent of the base. The caudal is broad, with the posterior margin rounded; its length $\frac{2}{3}$ of the head. The first undivided anal ray commences opposite the termination of the dorsal fin, which it resembles. The pectorals are broad, rounded; their length is a little less than that of the dorsal. The spines commence immediately behind the upper lip, and terminate a little behind the dorsal, and immediately behind the anal, leaving the tail naked. In form they resemble those of *T. carduus*. Single individuals, none of which exceeded the length stated, were observed at all seasons at Pinang.

Tetrodon bondarus, Cantor.

Russell, XXVII. Bondaroo Kappa.

Young. Head above, lips, lower half of the sides and abdomen very pale yellowish olive, minutely dotted with brown; back blackish olive; upper half of the sides brownish olive, with numerous rounded brownish-white spots, many of which are surrounded by a broad black ring, forming a kind of interrupted net-work; inside and behind the pectorals a large black spot, in which a bright yellow oval half-ring, cut by the axilla; a little in front of the pectorals a bright yellow oval spot, half hid by the black gill-cover; on the sides of the head a number of small brownish white spots, and a large black spot like an erect horse-shoe; on the throat a round black spot from whence a widely arched black line ascends to each pectoral; dorsal, anal and pectorals pale brownish olive, minutely dotted with black; caudal darker brownish olive with

numerous indistinct whitish spots, and with a broad black band along the posterior margin. Iris bright yellow minutely dotted with black.

D 10, C $9\frac{2}{1}$, A 9, P 18, Br. V.

Habit.—*Sea of Pinang.*

Vizagapatam.

The length of the head is contained $4\frac{1}{3}$ times in the total. The eye borders on the profile and occupies nearly the centre of the distance between the muzzle and the gill-opening, but it is on a level above the latter and the pectorals; the greatest diameter, ascending obliquely backwards, is $\frac{1}{4}$ of the length of the head; the distance between the anterior angles of the orbit is $1\frac{1}{2}$ such diameters; between the posterior angles it is two such. There are no nostrils, but in their place appear two lanceolate black tentacula, of which the upper one is the longer, both joined at the base. The teeth and tongue are normal. All the fins are rounded. The first dorsal ray is situated a little behind the commencement of the posterior third of the body, the caudal not included; the two first rays are undivided; the fifth and sixth, the longest, are contained $2\frac{1}{2}$ times in the head; the extent is $\frac{1}{5}$ less; the distance from the caudal is contained $5\frac{1}{2}$ times in the total length. The anal* is situated behind the dorsal, which it resembles; its distance from the caudal slightly exceeds $\frac{1}{7}$ of the total. The length of the caudal is $\frac{3}{4}$ of the head; that of the pectorals is a little less than the dorsal. The spines in form and position resemble those of *T. testudineus*, but above they commence from between the eyes. A single young individual was observed at Pinang in May 1844.

Sides smooth without spines.

Tetrodon lunaris, Cuvier.

Russell, XXIX. Kappa Koorawah.

Tetrodon lunaris, Cuv. R. A. Ed. 1, II. 148 (').

Tetrodon tepa, Buchanan Hamilton, 10, and 362.

(Icon.) Tetrodon leiopleura, Gray: Ill. Ind. Zool. I. Pl. 87, Fig. 2, *(Young.)*

Tetrodon lunaris, Rüppell: Neue Wirbelth. Fische, 59.

* The position of this fin is correctly described by Russell, but his figure represents it in a much too advanced position.

Physogaster* lunaris, Müller: Abh. Berl. Akad. 1839, 252 (').

Tetrodon lunaris, Temm. et Schl. Fauna Jap. Pisc. CXXII. Fig. 1.

Head above and back green olive with a mixture of brownish, lighter on the upper third of the sides; rest of the latter to the abdominal keel, sides of the head and opercles white satin with a broad longitudinal band of shining yellow brass from the eye to the caudal; abdomen milk-white; fins yellow; posterior caudal margin blackish. Iris bright yellow brass-coloured, blackish towards the orbit.

D 12, 13 or 14, C $8\frac{2}{1}$, A 11 or 12, P 16, Br. V.

Habit.—*Sea and estuaries of Malayan Peninsula and Islands.*

Coromandel, Bay of Bengal, Gangetic estuaries, Suez, Japan.

Total length: 1 foot.

The length of the head slightly exceeds $\frac{1}{4}$ of the total. The eye, bordering on the profile, is situated nearer the gill-opening than the muzzle, above the level of the former and of the pectorals; its longest diameter, ascending obliquely backwards, is $\frac{1}{3}$ of the length of the head. The distance between the eyes equals the diameter. The oval nasal cavity is situated midway between the eyes and the muzzle; each contains two small papillular apertures. The teeth and tongue are normal. The thread-like lateral line commences beneath the posterior part of the nasal oval cavity, descends a short distance nearly vertically, then proceeds horizontally over the upper part of the cheek; opposite the posterior part of the orbit it ascends obliquely to the upper margin of the opercle, between which and the posterior angle of the orbit it gives off a branch which describes an arch over the supraorbital margin. From the upper margin of the opercle the lateral line follows the profile of the back, a little above the lower margin of the spiny portion to a little in front of the dorsal, when it descends obliquely and then continues nearly in the middle of the tail, nearer, however, the soft abdominal keel than the profile of the

* Physogaster, *Müller*, 1841. "With a hollow papilla in the nasal cavity, not, however, continued in a tube; lateral margin of abdomen raised into a soft keel from the throat to the tail, corresponding to a second, superior keel on the sides of the tail."—*Physogaster* is inadmissible, as it has been applied by Latreille in 1833 to a genus of *Coleoptera*.

back, and terminates at the root of the caudal. The soft abdominal keel commences from the throat and proceeds straight along the upper margin of the spiny portion of the abdomen to the lower part of the root of the caudal. The dorsal is situated a little behind the commencement of the posterior third of the back; the two first rays are undivided; the second, the longest of all, is $\frac{1}{2}$ the length of the head; the posterior margin of the fin is nearly vertical; the extent of the base is $\frac{1}{2}$ of the length of the second ray; the distance from the caudal is contained $4\frac{1}{3}$ times in the total length. The first and only undivided anal ray is placed opposite the posterior half of the dorsal, which it resembles, but the extent is a little less; the distance from the caudal is contained $4\frac{1}{2}$ times in the total length. The upper and lower caudal margins are arched, but the former is a little longer than the latter; the third, or first divided, ray from above is the longest, $\frac{3}{4}$ of the length of the head; the posterior margin is concave or crescent-shaped. The pectorals are broad, their posterior margin obliquely truncated; the second upper ray is the longest, $\frac{1}{2}$ of the length of the head. The spines are short, strong, crowded and deeply imbedded in the integuments. Above they commence from the space between the nostrils and terminate a little in front of the dorsal; laterally they extend but very little below the lateral line; on the abdomen they commence from a little behind the throat, are bounded above by the soft keel, and terminate with the anterior half of the body. In the figure of M. M. Temminck and Schlegel in *Fauna Japonica* the spines are represented more distant than they are in the individuals of the Malayan Seas and of the Bay of Bengal, and they appear above to commence from the occiput. In both the latter localities the species is at all seasons very numerous.

Tetrodon oblongus, Bloch.

Tetrodon oblongus, Bloch, Tab. 146.

Tetrodon oblongus, Shaw, V. 446.

Tetrodon oblongus, Cuv. R. A. Ed. I. 148 (').

Physogaster oblongus, Müller, l. c.

Young. Head above dark brownish olive with numerous rounded brownish white spots; back and upper third of the sides brownish white, minutely dotted with reddish brown, and with upwards of 11 short dark brownish vertical bands, confluent on the back, and not

extending beyond the upper third of the sides; rest of the latter and those of the head pale yellowish buff dotted with reddish brown; abdomen milkwhite; fins transparent yellowish buff, minutely and sparingly dotted with black.

D 13, C $8\frac{2}{3}$, A 10, P 17, Br. V.

HABIT.—*Sea of Pinang.*

Indian Ocean.

TOTAL LENGTH: $5\frac{6}{8}$ inch.

The length of the head is a little less than $\frac{1}{4}$ of the total. The eye, bordering on the profile, is situated a little nearer the gill-opening than the muzzle, above the level of the latter and the pectorals; its horizontal diameter is $\frac{1}{4}$ of the head; the distance across the forehead two such diameters. Each nostril has two small papillular apertures. The teeth and tongue are normal. The posterior part of the opercle is naked terminating below in a sharp, downwards pointed angle. The elongated rounded dorsal is situated a little behind the commencement of the posterior third of the back; the anterior four rays are undivided; the sixth and seventh, the longest, are $\frac{1}{2}$ of the length of the head, of which the extent of the base is $\frac{1}{4}$; the distance from the caudal is a little less than $\frac{1}{6}$ of the total length. The anal commences opposite the third dorsal ray; the three anterior rays are undivided; the sixth, the longest, equals the corresponding dorsal; the posterior margin is vertical; the extent of the base is a little less than that of the dorsal; the distance from the caudal equals that of the latter. All three margins of the caudal are slightly arched; the length of the fin is about $\frac{4}{5}$ of that of the head. The pectorals are broad; the posterior margin is a little rounded; the first upper ray, the longest, is contained $2\frac{1}{2}$ times in the head. The very fine hair-like lateral line appears to commence from behind the occiput; at first it follows closely the profile of the back, when it descends obliquely to opposite the last dorsal ray, and then continues in the middle of the tail to the caudal. The abdominal keel is so little raised as scarcely to deserve the name; it commences behind the throat and rises in a low arch towards the pectoral fin, from whence it obliquely descends to a little in front of the anal, and follows the profile of the abdomen to the lower part of the root of the caudal. The spines are short and not very strong, but crowded; above they commence from between the nostrils and terminate a little in front of the dorsal; the

opercles, except the posterior part of the opercle, and the abdomen to a little in front of the anus, are spinous ; but the cheeks, lips, throat and the posterior part of the body, from between the anus and dorsal, are naked. A single individual was observed at Pinang in January 1844.

TETRODON DISSUTIDENS, Cantor.

Russell, XXV. II. Kappa, *(Young.)*

Crown and sides of the head and back satin reddish brown with purple reflections, lighter on the sides of the body, minutely dotted with reddish brown ; back and sides with numerous large rounded spots, dark brownish or olive white ; three or four blackish brown vertical bands, indistinct and spotted like the rest, viz. one between the eyes, a second behind the pectorals, surrounding the gill-opening ; a third, not constant, between the latter and the dorsal ; a fourth from the base of the dorsal ; abdomen milk-white ; the indistinct abdominal keel in some individuals light yellow ; dorsal, pectorals and caudal transparent whitish olive minutely dotted with brown ; posterior half of the caudal blackish ; anal whitish. Iris bright yellow, minutely dotted with black towards the orbital margin.

D 10, C $8\frac{1}{2}$, A 8, P 16, Br. V.

HABIT.—*Sea of Pinang.*

Coromandel.

TOTAL LENGTH : 7 inch.

The head is elongated, contained $3\frac{1}{2}$ times in the total length. The eye is situated a little nearer the muzzle than the gill-opening, with which the lower margin of the orbit is nearly on a level ; the horizontal diameter of the eye is $\frac{1}{4}$ of the length of the head ; the distance between the anterior angle of the orbits equals two such diameters ; between the posterior angles it is $2\frac{1}{2}$. A little in front of the anterior angle of the orbit appears a single small aperture, with a small simple tentacle at the anterior margin. The suture of the two upper teeth is not closely fitting as in the other species, but a little open so as to display 6 or 7 small denticulations on the corresponding margin of each tooth ; otherwise the teeth and tongue are normal. The rounded dorsal is situated a little behind the commencement of the posterior third of the body, the caudal not included ; the two first rays are undivided ; the third and fourth, the longest, are contained $2\frac{1}{2}$ times in the length of the head, of

which the extent of the base but slightly exceeds $\frac{1}{4}$; the distance from the caudal is $\frac{1}{5}$ of the total length. The anal commences opposite the posterior half of the dorsal, which it resembles in form and length, but the extent of the base is a little shorter; the distance from the caudal is contained $5\frac{1}{3}$ times in the total length. The three caudal margins are slightly convex; the length of the fin is $\frac{3}{5}$ of the head. The pectorals are broad, slightly rounded, the lower rays are but little shorter than the upper which are contained $2\frac{2}{3}$ times in the length of the head. The spines are rather short and fine, and disposed on two separate spots. Above they cover a narrow oval spot from behind the occiput to opposite the termination of the pectorals; laterally they extend to within a vertical distance from the gill-opening of $\frac{1}{4}$ of the length of the head; they are very distant and so deeply imbedded, as easily to escape observation. Below they commence on a level with the angle of the mouth, but opposite the posterior margin of the orbit, their anterior margin is deeply excavated; the lateral margin describes an arcb, which keeps a little beneath the lower part of the root of the pectoral, and terminates behind at some distance in front of the anal, which is situated nearly opposite the first dorsal ray. The spines of the anterior half are crowded; those of the posterior distant. Along the arched lateral margin of the spinous spot appears an indistinct abdominal soft keel, which afterwards continues straight to the lower part of the root of the caudal. The other parts of the body are naked. No lateral line is visible. Smaller individuals of this species are at Pinang very numerous at all seasons.

Tetrodon naritus, Richardson.

Plate X. *(Young).*

Tetrodon naritus, Richardson: Ichthyol. Voy. Samarang, 18, Pl. VIII. Figs. 1-3.

Young. Head and body yellow brass-coloured; head above, back and upper half of the sides minutely dotted with black, so closely as to appear blackish; fins bright gamboge; dorsal, caudal and anal each with a single large irregular black spot, occupying the greater part of these fins, but leaving open a narrow space along the base; lips whitish lilac. Iris shining brass-coloured.

Adult. Head and body burnished reddish golden, or bronze; back and upper half of the sides paler blackish than in the young; as also the spots of the fins. Iris coloured like the body, bluish black towards the orbit.

D 35 or 36, C $9\frac{2}{2}$, A 28 or 29, P 17, Br. V.

Habit.—*Sea of Pinang.*

River Saráwak (Borneo).

Total length: 10 inch.

The general form is elongated pyriform, laterally compressed. The profile rises obliquely to between the eyes, from which it is nearly straight to the dorsal, when it greatly slopes towards the caudal. The abdominal profile is much more bulging; from the throat to opposite the pectorals it descends obliquely; from thence it rapidly ascends to the caudal. The cranial bones are soldered together and form a smooth helmet, arched from side to side, in shape somewhat resembling that of *Plotosus albilabris*, Cuv. and Val. The anterior extremity of the helmet is constricted and divided in two diverging narrow points formed by the anterior frontal bones, which behind border the depression containing the nostril. From thence the lateral margin is convex forming the supraorbital margin, when it deviates obliquely inwards and backwards, and terminates on the side of the occiput in a broad triangular point. From the centre of the posterior margin projects along the back a narrow occipital crest. The outline of the helmet resembles a broad arrow-head with bifid point. The distance from the muzzle to the point of the occipital crest equals that to the gill-opening, which is contained $3\frac{1}{2}$ times in the total length. Measured from the centre between the anterior two points, the length of the helmet is $\frac{1}{5}$ of the total, and of this distance the occipital crest itself is $\frac{1}{3}$. The eye, bordering on the cranial helmet and on a level with the upper part of the gill-opening, is situated in front of the centre of the distance between the muzzle and the gill-opening; the horizontal diameter is $\frac{1}{6}$ of the length of the head. The distance between the anterior orbital angles across the helmet is $1\frac{1}{2}$, between the posterior $2\frac{1}{2}$ diameter. In front of the anterior orbital angle appears a single large nostril, which is oval, with a lax membrane, notched at the anterior part. The jaws are nearly equal; the teeth and the tongue normal. The form of the dorsal is broad triangular, with the posterior part truncated a little

rounded; the first ray is situated nearly in the centre between the muzzle and the caudal; the first five rays are undivided, and with the succeeding ones gradually increase in length to the 14th and 15th, which are the longest, $\frac{1}{2}$ the length of the head; the extent of the base is contained $3\frac{1}{4}$ times in the total length, of which latter the distance from the caudal is $\frac{1}{9}$. The anal commences opposite the second third of the dorsal, which it resembles in form; the two first rays are undivided; the 10th and 11th rays are the longest, a little shorter than the 14th and 15th dorsal. The extent of the base is a little less than the length of the head; the fin terminates a little behind the dorsal. The three margins of the caudal are a little convex; the length slightly exceeds $\frac{1}{2}$ of the head. The pectorals are broad oval; their length is about $\frac{1}{3}$ of the head. The spines are strong, distant, upwards pointed and scarcely longer than their two oblique roots. They are placed so as to form a broad belt, the superior margins of which commence behind the orbit, and proceed straight to a little behind the pectorals; from thence the posterior margin encircles the abdomen to within a short distance of the anus, which is situated opposite the commencement of the dorsal; the anterior margin follows the posterior part of the cheek and then proceeds obliquely forwards behind the throat. The rest of the body is perfectly smooth, without abdominal keel. During life the lateral line is very indistinct, On the vertex and the cheeks appear several anastomosing lines, which on each side continue in three undulating lines: one close to the back, a second in the middle, and a third near the abdomen; all three terminate at the root of the caudal. Three individuals, varying from $4\frac{7}{8}$ to 10 inches in length, were observed at Pinang in February and November 1844, and in July 1845. The enlargement of the upper and under interspinous bones of the tail, described by Richardson, is no constant character. It existed in none of those examined at Pinang, but one of them had an isolated osseous tubercle in front of the anal, another had a similar in the middle of the left side. Like *Harpochirus punctatus* and *Platax arthriticus* the present species appears to have a tendency to hypertrophy of the bones.

All the preceding species of *Tetrodon* are capable of inflating the abdomen, and in this state, when taken or handled, they emit a grating sound. They are also remarkable for tenacity of life, which they are

capable of sustaining for several hours after having been taken out of their element. They have a peculiar disagreeable odour, resembling that of *Gobioidæ*, which continues in specimens for several years preserved in spirits of wine. In the Malayan countries they are considered highly poisonous, and are even objected to as manure.

Ordo LOPHOBRANCHII.

Fam. SYNGNATHOIDÆ.

Gen. Syngnathus, *Artedi*, 1738, (*Cuvier*, 1817.)

Snout tubular, formed by the prolongation of the ethmoid, vomer, tympanals, pre-opercles, sub-opercles, &c., and terminated by an ordinary mouth, vertically cleft on the extremity of the snout; respiratory aperture near the nape; ventrals none; body elongated, thin, differing but little in diameter throughout its whole length.

A. Without anal.

Syngnathus penicillus, Cantor.

Head and body pale greenish brown, minutely dotted with brown on the sides; in the middle of each ring of the body a horizontal, oval, cream-coloured spot, beneath edged with black; on each side of the abdomen an indistinct cream-coloured dot; pectorals, dorsal and the membranous sac hyaline, the latter minutely dotted with pale brown; caudal rays blackish, with hyaline points. Iris and the circular pupil black.

D 22, C 6, P 18. Br.? Rings of the body 18, of the tail 35.

Total length: $3\frac{6}{8}$ inch.

Habit.—*Sea of Pinang.*

The length of the head is contained $4\frac{1}{2}$ times in the total; the distance from the posterior margin of the orbit to the gill-opening is $\frac{2}{5}$ of the length of the head; that from the symphysis of the lower jaw to the anterior margin of the orbit is $\frac{3}{5}$ of the length of the head; the diameter of the orbit is $\frac{1}{10}$ of the head; the distance between the eyes is less than their diameter. From the posterior margin of the orbit proceeds a sharp raised line a little downwards to the posterior margin of the opercle; from above and below radiate backwards a number of very fine lines. The body and tail, as far as the membranous sac

extends, are hexagonal, the greatest vertical diameter is $\frac{1}{5}$ of the length of the head; the rest of the tail is quadrangular, tapering, but not terminating in a point. The anus is situated as much as the length of the snout in front of the middle of the total length. The membranous sac is attached to the abdominal surface of the 15 anterior caudal rings; it forms a segment of a circle, its greatest depth not exceeding the diameter of the eye. The dorsal commences a little behind the anus; the length of the rays is $\frac{1}{5}$, the extent of the base $\frac{2}{5}$ of the length of the head. The length of the pectorals equals that of the dorsal. The posterior surface of the last caudal ring carries 6 very minute branched rays, which are placed horizontally, at a distance from each other: one at each of the four angles, and one from the middle of the lateral margin. This distribution gives the caudal the appearance of a small brush. A solitary individual was observed at Pinang in July 1845. This species is readily distinguished from *S. spicifer*, Rüppell* and from *S. gooraphoo*† by the comparatively longer head.

B. Without caudal.

SYNGNATHUS BIACULEATUS, Bloch.

Syngnathus biaculeatus, Bloch. Tab. 121, Fig. 1, 2.

Syngnathus biaculeatus, Bloch-Schneider, 515, Tab. 1.

Syngnathus biaculeatus, Shaw, V. 453.

Syngnathus biaculeatus, Richardson, Report, 1845, 202.

Head and body pale seagreen; abdomen pale ochre or buff; in the middle of the side of the rings of the body a large vertically oval spot, lighter than the general colour, edged with very pale vermilion; in some a few black dots, scattered along the sides of the abdomen; fins hyaline. Iris pale silvery green, dotted with brown.

D 43 to 45, A 3, 4 or 5, P 21 or 22, Br. IV? Rings of the body 18, of the tail about 55.

TOTAL LENGTH: $9\frac{6}{8}$ inch.

HABIT.—*Sea of Pinang, Singapore, Malayan Peninsula.*
China Seas, Philippines.

The length of the head is contained a little less than $5\frac{1}{3}$ times in the

* Neue Wirbelth: Fische, 143. Tab. 33, Fig. 4.

† Russell, 21, No. XXX. *Gooraphoo Subbookoo*, ("*S. typhle*, Lin.")

total; the distance from the posterior margin of the orbit to the gill-opening is nearly $\frac{1}{4}$ of the head; that from the symphysis of the lower jaw to the anterior margin of the orbit exceeds by $\frac{1}{5}$ half the length of the head. The diameter of the orbit is $\frac{1}{7}$ of the length of the head. The distance across the forehead is a little less than one diameter. From the posterior part of the supraorbital margin rises a small, backwards directed thorn, which like the rest of the head is minutely honey-combed. A similar, but smaller thorn appears in the middle of the anterior and posterior margin of the orbit. The opercles are soldered together, and with numerous backwards radiating lines. The occipital crest is surmounted by 3 minute thorns. The body and tail, as far as the dorsal extends, are heptagonal; the rest of the tail is quadrangular, gradually tapering into a point. The greatest vertical diameter, halfway between the head and the dorsal, is about $\frac{1}{4}$ of the length of the head; the greatest horizontal diameter of the back is contained from $6\frac{1}{2}$ to 7 times in the length of the head, while that of the abdomen varies from $2\frac{1}{2}$ to 3 times in the head. The anus is situated as far behind the middle of the total length as $\frac{2}{3}$ of the length of the snout. The dorsal commences on the 18th ring of the body, a little in front of the anus, and continues on the 10 anterior rings of the tail; the extent of the base is one diameter of the orbit shorter than the head; the dorsal and pectoral rays scarcely exceed $\frac{2}{3}$ of the diameter of the orbit; the anal rays are about $\frac{1}{2}$. Single individuals occur in the Straits of Malacca during all seasons.

Gen. Hippocampus, *Cuvier*, 1817.

Trunk laterally compressed and conspicuously more elevated than the tail; the junctions of the rings are raised into ridges and their salient angles into spines; caudal none.

Hippocampus mannulus, Cantor.

Plate XI. Fig. 1.

Young. Pale greyish brown; sides and abdominal surface of tail pale yellowish.

Length: $3\frac{5}{8}$ inch.

Older. Pale yellow ochre; fins hyaline; dorsal with two longitudinal series of blackish spots. Iris silvery bluish-grey.

Length : 5 inch.

D 19, A 4, P 17, Br. ? Rings of the body 11, of the tail 36.

Habit.—*Sea of Pinang.*

The length of the head is $\frac{1}{5}$ of the total ; the distance from the symphysis of the lower jaw to the nostril is $\frac{1}{2}$ of the length of the head, of which the diameter of the orbit is $\frac{1}{8}$. From the middle of the supra-orbital margin rises a small backwards directed spine ; the distance between both is less than the diameter of the orbit. From the posterior margin of the orbit radiate numerous lines over the opercles. The occiput carries a crest, surmounted in front by a tubercle, behind by five minute spines ; at the root of the pectorals, and on each side of the throat appears a small backwards directed spine. The body is heptagonal, its greatest vertical diameter slightly exceeds $\frac{1}{2}$ of the length of the head ; the tail is quadrangular, tapering into a point. The anus is situated nearly in the middle of the total length, and opposite the middle of the dorsal. The latter occupies the 10th and 11th ring of the body and the first of the tail ; all three rings are arched, so as to appear like a crest from which the dorsal rises. The length of the rays is a little less than two diameters of the orbit ; the extent of the base is $\frac{3}{8}$ of the length of the head. The pectorals are a little shorter than the dorsal ; the anal is about half the diameter of the orbit. One individual was observed at Pinang in September 1842 ; a second in January 1844.

Hippocampus comes, Cantor.

Plate XI. Fig. 2.

Brownish buff ; opercles bluish ; round the orbit a few distant brown dots ; fins hyaline. Iris silvery white with a number of short brownish lines radiating from the pupil.

D 16, A 4, P 17, Br. ? Rings of the body, 11, of the tail, 33.

Total length : 5 inch.

Habit.—*Sea of Pinang.*

The length of the head slightly exceeds $\frac{1}{6}$ of the total ; the distance from the symphysis of the lower jaw to the nostril is $\frac{3}{8}$; the diameter of the orbit is $\frac{1}{8}$ of the length of the head. All the spines of the salient angles are surmounted by oval or rounded tubercles. On the forehead between the eyes appears a single spine ; on each supraorbital

margin a similar, and between the two a pair of smaller ones ; single ones also appear at the anterior and posterior margin of the orbit, and a pair a little beneath the lower margin. The occipital crest is surmounted by three spines, behind which rise five smaller ones forming a cluster like a coronet. At the root of the pectorals appear two, and a pair on each side of the throat. Over the opercles radiate some fine lines. The body is heptagonal ; its greatest vertical diameter slightly exceeds the length of the snout to the nostrils. The tail is quadrangular, tapering into a point. The anus is situated nearly in the middle of the total length, opposite the posterior third of the dorsal. The latter occupies the 10th and 11th ring of the body and the first caudal ; the length of the rays is $1\frac{1}{2}$ diameter of the orbit, the extent of the base is contained about $3\frac{1}{2}$ times in the length of the head. The pectorals are a little shorter than the dorsal, and the anal is the shortest of all. A single individual occurred at Pinang in August 1844.

Subclassis : SELACHII.

Ordo : PLAGIOSTOMI.

Subordo : SQUALI.

Fam. SCYLLIOIDÆ.

Gen. Scyllium, *(Cuvier,* 1829,*) Müller und Henle,* 1841.

Anterior dorsal between the ventrals and anal ; posterior between the anal aud caudal ; spiracles immediately behind the eyes ; gill-openings equidistant : both posterior ones immediately above the pectorals ; snout short, blunt ; nostrils near the mouth, in some continued in a fissure to the margin of the upper lip ; superior nasal valves covering the nostrils, so as generally to leave but a small rounded aperture at the external margin ; nasal valves either separated by a larger or smaller piece soldered between their centre, or both united ; in some in the middle of the external surface a projection, which occasionally extends beyond the lower margin of the valve ; in others at the inferior margin of the nostril a smaller valve covered by the larger ; mouth arched ; teeth with a central point aud one or two on each side ; several species with the ventral fins united over the male appendages ; scales trifid ; ova resembling those of the Rays.

Scyllium maculatum, Müller und Henle.

Scyllium marmoratum, Benuett : Life of Raffles, 693 ?

(Icon.) Scyllium maculatum, Gray : Ill. Ind. Zool. I. Pl. 98, Fig. 1.

Scyllium maculatum, Müller und Henle : Plagiostomen 5, Taf.

Scyllium maculatum, Richardson : Report, 1845, 193.

(Young male.) Ground-colour of the back white, of the sides, vertical fins and upper surface of horizontal fins light slate-blue, with numerous confluent rounded spots, of snuff colour, forming a kind of network ; near the apex of the two dorsal-, of the caudal- and anal fins a transversal snuff-coloured band ; abdomen, lower surface of pectorals and ventrals and the male appendages bluish white. Iris silvery slate-blue ; pupil obliquely linear, black.

Habit.—*Sea of Singapore.*

Indian Ocean, China Sea, Canton.

Total length : 1 foot 7 inch.

The anterior dorsal is situated midway between the apex of the snout and that of the caudal; it commences opposite the termination of the ventrals. The posterior dorsal commences at an equal distance from the root of the ventrals and the apex of the caudal. The anal fin commences a little in front of the posterior dorsal, but it terminates before reaching the middle of that fin. The scales are trifid, with a central, flat, pointed keel, and with a minute point on each side. In time the scales become worn and subrhombic.

A single young male was taken at Singapore in May 1840. Each male appendage measured $2\frac{2}{8}$ inch in length.

Gen. Chiloscyllium, *Müller und Henle*, 1837.

Snout blunt; nostrils extending to the mouth; nasal valves separated, each carrying a filament; at the external margin of each nostril a considerable hem-like valve, which continues towards the upper fold of the angle of the mouth; under lip skinny, broad, separated from the throat by a transverse furrow; mouth slightly arched; teeth pointed, with one or two smaller points on each side; spiracles behiud and below the eyes; at the posterior margin of each spiracle a projecting tubercle; fourth and fifth gill-opening near each other; dorsal fins placed in frout of anal; the anterior dorsal behind the ventrals; pectorals and ventrals rounded, as also the anal and caudal; the anal, without anterior angle, is arched downwards, terminating behind in a point; lower margin of the caudal convex.

Chiloscyllium plagiosum, (Bennett.)

Russell, XVI. Bokee Sorrah (*Young.*)

Russell, Ra Sorrah, page 10 (*Adult.*)

Scyllium freycineti, Quoy et Gaimard. Freyc. 192 ? (*Young ?*)

Scyllium plagiosum, Bennett: Life of Raffles, 693. (*Young.*)

(Icon.) Scyllium ornatum, Gray: Ill. Ind. Zool. I. Pl. 98, Fig. 2. (*Young.*)

Chiloscyllium plagiosum, Müller und Henle, 18 (*Young.*)*
Chiloscyllium plagiosum, Var 1, Müller und Henle, 18. (*Young.*)
Chiloscyllium plagiosum, Var 2, Müller und Henle, 18. (*Young.*)
Russell: p. 10, "Vielleicht eine Varietät," Müller und Henle, 20. (*Adult.*)
Chiloscyllium plagiosum, Richardson: Report, 1845, 194.
Yu tókay of the Malays.

(*Newborn and very young.*) Ground-colour above white or buff, with numerous black transverse bands, preponderating over the ground-colour, which appears on the head and back like transverse buff bands, each with a transversal brown line in the centre. On the sides and fins the ground-colour is reduced to a number of rounded spots, each with a central brown dot. Lower surface of the body and horizontal fins whitish, of the tail pale blackish. Iris black, with a silvery line bordering the black pupil, which is linear and ascending obliquely backwards. TOTAL LENGTH: 4 to $6\frac{4}{8}$ inch.

(*Older.*) Ground-colour ash-grey or isabella coloured, with (11, 12 or 13) pale brownish black transverse bands, broad on the back, narrower on the sides; the margins darker than the bands, or with distant dark dots; fins with dark and light spots; abdominal surface whitish. Iris silvery ash-grey or isabella coloured. (Russell, XVI., *Bokee Sorrah.*—*Scyllium plagiosum*, Bennett.—*Var.* 1, Müller und Henle.)

Or:

Ground-colour ash-grey or nankin yellow with transverse brownish bands edged with black; within the bands double transverse rows of black dots; single such between the bands; on the sides and fins black rings, each with a central black spot. (*Scyllium ornatum*, Gray. —*Var.* 2, Müller und Henle.—*Chiloscyllium plagiosum*, Richardson.—) TOTAL LENGTH: $7\frac{4}{8}$ to $14\frac{4}{8}$ inch.

* VAR. 3 and VAR. 4, Müller und Henle, are founded upon two unpublished drawings of General Hardwicke. Both have evidently been taken from specimens in the infantile livery, and are no more constant Varieties than VAR. 2 and 3 of M.M. Müller und Henle.

(*Adult.*) Above uniformly ash-coloured or yellowish grey; whitish beneath. Iris silvery, of the ground colour. (*Ra Sorrah*, Russel.—"*Vielleicht eine Varietät*," Müller und Henle.—)

Total length: 1 ft. 5 inch to 2 ft. 4 inch.

Habit.—*Seas of Pinang, Malayan Peninsula, Singapore.*
Indian Ocean, Seas of China and Japan (Richardson), Coasts of Brazil (M. and H.)

The anterior dorsal fin commences immediately above the termination of the ventrals; the posterior dorsal commences as far from the anal as the extent of its own base. In young individuals the scales are narrow lanceolate and keeled; in the adult they are tetragonal or subrhombic, with a polished, not keeled, surface. In the young fish appears along the centre of the back a keel composed of scales larger than the rest; on each side, a little below the central keel appears a similar, which borders the upper third of the side. From the root of the ventral fins to the commencement of the anal appears on each side a third keel, which separates the sides from the abdomen. With age the dorsal keel becomes indistinct, but the others appear to vanish. In young individuals the male appendages do not extend beyond the anterior half of the inner margin of the ventral fins; in mature age their length is double that of the inner margin of the ventrals. The livery of the newborn and mature individuals is as constant as that of the intermediate age is liable to variations. The latter, which are but transitory garbs, have been described as constant and distinct Varieties by M. M. Müller und Henle. Russell is the only observer who described the mature fish. There appears, however, to exist a constant Variety, which is above of a uniform golden bronze colour, paler beneath, with reddish golden fins and with the iris of burnished gold. This Variety is rarely seen in the Straits of Malacca, at Madras,* and in the Bay of Bengal, as far as the 21st degree. In the Straits of Malacca the species is at all seasons excessively numerous.

* Walter Elliot, Esquire, possesses an adult male of this Variety, measuring 2 ft. $2\frac{3}{8}$ inch in length.

GEN. GINGLYMOSTOMA, *Müller und Henle*, 1837.
(NEBRIUS,* *Rüppell*,) 1837.

Snout blunt; nostrils extending to the mouth, with a short valve at the internal margin, from which proceeds a long cirrus extending to the mouth; a second short valve at the external margin of the nostrils; mouth convex; the folds of the angle of the mouth divided by a deep fissure in an upper and lower fold; the internal extremity of the lower fold separated from the skin of the under lip by a more or less deep, vertical furrow; teeth very numerous, upwards of ten close series, their base rhomboidal, with a central conical apex, with two to four gradually decreasing blunt points on each side; the fifth branchial opening almost hidden in the fourth; both situated above the pectoral fins; spiracles very minute, immediately behind the eyes; anterior dorsal fin opposite the ventrals; posterior dorsal partly in front of, partly opposite the commencement of the anal; the latter fin nearer the caudal than the ventrals, yet not immediately in front of the caudal; the latter with a trace of an inferior lobe; pectoral fins longer than in the rest of *Scyllioidæ*.

GINGLYMOSTOMA CONCOLOR, (Rüppell.)

Nebrius concolor, Rüppell, Neue Wirbelth, 61, Taf. 17, Fig. 1.
Rüppell, Chondropt: 2, Taf. 17, Fig. 2.
Ginglymostoma concolor, Müller uud Henle, 22, Taf.

Young. Light browuish buff. Iris silvery light grey; pupil linear, oblique.

HABIT.—*Sea of Pinang*.
Indian Ocean, Massauah (Red Sea).

TOTAL LENGTH: 2 ft. 5 inch.

The anterior dorsal fin commences a little behind the origin of the ventrals, but exteuds farther back than the termination of the latter. The posterior dorsal commences a little in front of the anal and terminates a little in front of the termination of the latter fin. The scales are broad lanceolate or sub-rhombic with an indistinct central tubercle. The denticulations of the posterior margins are very indistinct, and the scales which are worn down have a polished granular appearance. In the upper jaw appear but three, in the lower four series of teeth, the

* Pre-occupied by *Nebria*, Latreille, 1802 (*Coleopt.*)

central apex of which scarcely exceeds the lateral points which gradually decrease. During life the fish carries the tail much more erect than is represented in the figures of M. M. Rüppell, Müller and Henle. The length of the male appendages is less than one-half of the inner margin of the ventral fins. During life this species is distinguished by its beautiful light tint and by its proportions. A solitary young male was taken at Pinang in March 1845. It lived for about two hours in the air. The stomach contained remains of small *Crustacea*. The length of the intestinal canal slightly exceeded $\frac{1}{6}$ of the total length of the fish.

Gen. Stegostoma, *Müller und Henle*, 1837.

Mouth transverse and narrow; at the upper and lower jaw the integumeuts form two flattened rims, which carry the teeth; the latter exhibit tripartite laminæ; the centrepiece between the nasal valves is much broader than the valves themselves, and forms a transverse thick rim over the mouth, which above and in front can be covered by this rim. The latter has a rounded free margin in which unite the anterior and posterior surfaces; the posterior, generally hidden, surface is scaly like the rest. The nasal valves are reduced to skinny hems which laterally enclose the central rim. The nasal valves terminate in a strong cirrus. The lower margin of the nostril has no valve. The folds of the augle of the mouth are short; the fossets deep. The head is highly arched and rounded. The cleft between the eyelids is very small, transversely oval, with sharp margins. The spiracles are vertical fissures behind the eye. The fifth branchial opening is hid in the fourth; the third, fourth and fifth appear immediately above the pectoral fins. The anterior dorsal is placed opposite the ventral fins, but extends somewhat in advance; the posterior dorsal is placed between the ventrals and the anal. The latter is placed immediately in front of the caudal. The latter is nearly throughout of uniform height, with the usual incision before the apex, and it is proportionally very elongated.

Stegostoma fasciatum, (Bloch.)

Seba: Thes. III. 105, Tab. 34, No. 1.
Gronov. Mus. I. 82, No. 136.—Zoophyl. 34, No. 147.
Le tigre, Brouss. 658.
Squalus fasciatus, Bloch. 113.
Squalus tigrinus, Linné: Syst. 1493. (*Young.*)

Squalus longicaudus, Ibid. 1496.
Zebra Shark, Shaw: Nat. Misc. 434.
Squale tigre, Lacépède, I. 249.
Squalus fasciatus, Shaw: V. 148. Pl. 148. (*Newborn.*)
Squalus fasciatus, Bloch-Schn. 130.
Russell: XVIII. Poollee Makum. (*Newborn.*)
La roussette tigrée, Dict. des Sc. Nat. No. 33, Fig. 2.
Scyllium heptagonum, Rüppell: Neue Wirb. 61, Tab. 17, Fig. 1. (*Young.*)
Scyllium heptagonum, Rüppell: Chondropt. 1. Tab. 17. Fig. 1.
Stegostoma fasciatum, Müller und Henle, 24, Taf. (*Young*).
Stegostoma fasciatum, Var. 1, Müller und Henle, 25. (*Young.*)
Stegostoma fasciatum, Var. 2, Müller und Henle, 25. (*Young.*)
Stegostoma fasciatum, Var. 3, Müller und Henle, 25. (*Mature?*)
Stegostoma carinatum, Blyth: Journ. As. Soc. XVI. 725, Pl. XXV. *bis*, Fig. 1. (*Young.*)

Yu tókay of the Malays.

(*Newborn and very young.*) Ground-colour above yellowish white with numerous broad black transverse bands, preponderating over the ground-colour, which on the head and fins is reduced to single rounded or oval spots; lower surface of the body and horizontal fins yellowish white. Iris black with a silvery line bordering the black linear pupil, which ascends obliquely backwards. (Russell, XVIII. *Poollee Makum.* —*Var.* 1, Müller und Henle).—Total length: 12 to 13 inch.

(Older.) Ground-colour reddish- or brownish yellow, more conspicuous than in the newborn, particularly on the fins, where the brown colour is broken up into numerous rounded spots, (on the pectoral fins one or two large rings, with a central spot;) transversal bands reddish brown, with broad snuff-coloured or black margins; in some the bands of the head and body with numerous dark brown rounded spots. Iris like the ground-colour, but silvery. (*Var.* 2, Müller und Henle.—) Total length: 1 ft. 10 to 3 ft.

(*Mature? Adult?*) Ground-colour whitish brown; head from behind the eyes, body and fins with numerous snuff-coloured rounded spots, which are somewhat indistinct on the fins. *(Scyllium heptagonum,* Rüppell.—*Var.* 3, Müller und Henle.—*Stegostoma carinatum,* Blyth.—) Total length: 3 ft. to 5 ft. 7 inch.

Habit.—*Sea of Pinang.*

Indian Ocean, Bay of Bengal, Jeddah, (Red Sea.)

All the descriptions of this species have been taken from young individuals. According to Gmelin it attains a length of about 15 ft. The largest specimen quoted above is a female, collected at Madras by W. Elliot, Esq. The length of the body is 2 ft., of the tail 3 ft. 7 inch. the proportion of the latter is therefore less than in younger individuals, where the tail forms $\frac{2}{3}$ of the total length. The scales are rhombic, with a strong central keel and with 2 to 6 denticulations on each of the two anterior margins. In smaller individuals the scales are broad lanceolate, the central keel terminating in a sharp point, but the posterior margins are either not at all, or indistinctly denticulated. With age the seven raised keels become more distinct. Mr. Elliot has observed this species frequenting the shoals off the coast of Madras feeding on Molluscs. The stomach of several, dissected by him, contained large quantities of molluscous bodies, many of which with the opercula of different species of *Turbinidæ* attached. In a single young female, taken at Pinang in August 1845, the stomach contained remains of small *Crustacea*. Gmelin describes this species as feeding on *Crustacea* and *Testacea*. In a young individual 3 ft. in length, the male appendages did not exceed one half of the internal margins of the ventral fins. The Varieties, described by M. M. Müller and Henle, are but individual variations of the infantile livery.

Fam. NYCTITANTIDÆ.

A. without spiracles.

Gen. Carcharias, (*Rafinesque*, 1810,) *Müller und Henle*, 1841.

Snout flattened, more or less rounded, moderately long. Nostrils in the centre between the mouth and the point of the snout, or nearer the mouth, at the lateral margin of the snout. Labial cartilage very minute or absent. Ovary of the embryo communicating with a kind of uterine placenta by means of plaited folds. Oviduct either smooth or flocculent.

Sub Gen. Scoliodon, *Müller und Henle*, 1837.

Teeth of upper and lower jaw similar, but in the upper jaw appears an odd central tooth, trenchant, with the point directed outwards, but

not denticulated. The external part of the base forms a blunt protuberance, without or with a slight notch. Posterior dorsal fin placed either immediately opposite the anal, or above the posterior extremity of the latter. A distinct caudal groove above and beneath. Scales minute, tricarinate. Oviduct of the embryo flocculent.

Carcharias (Scoliodon) acutus, Rüppell.

Carcharias acutus, Rüppell : Chondropt. 5, Tab. 18, Fig. 4.

Carcharias (Scoliodon) acutus, M. u. H. 29.

Carcharias (Scoliodon) acutus, Richardson : Rep. 1845, 194.

Yu of the Malays.

Head above, back, sides and fins lead-grey, or light bluish grey ; beneath white. Iris light blue silvery, with a narrow silvery line bordering the black linear pupil.

Habit :—*Sea of Pinang, Singapore, Malayan Peninsula.*

Indian Ocean, Red Sea, Java, China Seas.

Total length : 3 ft.

The anterior dorsal fin is situated a little nearer the pectorals than the ventrals ; the upper and posterior margin join in a narrow elongated point. The posterior dorsal commences opposite the posterior half of the base of the anal ; both terminate in elongated points. The distance between the commencement of the ventrals and that of the anterior dorsal equals the distance from the commencement of the ventrals to that of the posterior dorsal fin. The fifth gill-opening is situated above the commencement of the pectorals. The scales are minute rounded, and with five, four or three keels. In young individuals the odd central tooth is considerably smaller than the rest. Single individuals occur during all seasons in the Straits of Malacca.

Sub Gen. Prionace,* *Cantor.*

(*Equivalent to* Prionodon, *Müller und Henle*, 1841.)

Teeth of either upper jaw, or of both jaws, finely denticulated on both sides, oblique or straight, trigonal, or with a small apex on a broad base. In the upper jaw almost invariably an odd central tooth. Oviduct of the embryo smooth, not flocculent.

* Πρίων, saw, ἀκή, edge.—Substituted for *Prionodon*, pre-occupied by *Prionodon*, Horsfield, 1823, *(Mam.)* The characters given are those of M. M. Müller and Henle.

Carcharias (Prionace) melanopterus, Quoy et Gaimard.

Squalus carcharias minor, Forskål: Descr. 20.

Squale requin, Lacép. V. 169, Tab. 8, Fig. 1.

Carcharias melanopterus, Quoy et Gaim. Freycin. Voy. Pl. 43, Fig. 1, 2.

Squalus ustus, Cuv. R. A. II. 388 (?).

Squalus spallanzanii, Lesueur: Journ. Acad. Philad. II. P. 2, 351.

Carcharias melanopterus, Bennett: Life of Raffles, 693.

Carcharias melanopterus, Rüppell: Chondropt. 3.

Carcharias (Prionodon) melanopterus, M. u. H. 43, Taf. (Teeth.)

Carcharias melanopterus, Temm. et Schl. Faun. Japon.

Carcharias (Prionodon) melanopterus, Richardson: Rep. 1845, 194, 317.

Carcharias (Prionodon) melanopterus, Bleeker: Verh. Batav. Gen. 6.

Head above, back, sides and fins lead-grey, or light bluish grey; anterior margins of the fins, (all the margins of the caudal,) and point of the pectorals bluish black; beneath white. Iris silvery grey with a blackish line bordering the vertically oval pupil.

Habit:—*Straits of Malacca.*

Red Sea, Waigiou, New Holland, Timor, Java, Sumatra, Madura, China Sea, Japan.

Total length: 3 ft.

In young individuals the teeth of the upper jaws have denticulated margins, but in the adult they are denticulated in both jaws. The teeth of the lower jaw are smaller and narrower than those of the upper. The anterior dorsal fin commences a little behind the termination of the pectorals; the posterior commences a little in front of the anal and extends to the posterior third of the latter fin. The points of all three are but moderately elongated. The ventrals commence at the posterior third of the distance between the commencement of the pectorals and the anal. The male appendages are shorter than the internal margin of the ventrals. The fourth and fifth branchial openings are situated above the pectorals. The snout is short and rounded in some, moderately elongated and pointed in others. The scales are minute, with from three to five keels. Single individuals occur at all seasons in the Straits of Malacca.

Gen. Sphyrna, *(Rafinesque,* 1810*)*, *Müller und Henle,* 1841.

(Zygaena, *Cuvier,* 1817.)

The anterior part of the head broad, flattened and laterally elongated; nostrils situated at the anterior margin; eyes at the lateral margins. Nasal valve a small triangular lobe at the internal margin of the nostril. No labial cartilage. Teeth of both jaws similar, resembling outwards pointing flattened pyramids, either trenchant or denticulated, with a section at the external margin of the base; central teeth in both jaws. Anterior dorsal nearer the pectorals than the ventrals; posterior dorsal smaller than the anterior, opposite the anal; incision of the caudal fin distinct. Oviduct of the embryos flocculent; ovary not attached to the walls of the uterus.

Sphyrna zygaena, (Linné.)

Libella, Belon, 61.
Zygaena, Rondelet, 389.
Gesner, Fol. LXXXII.
Libella, Salviani, 121, Tab. 40.
Aldrov. 408.
Jonston, Tab. VII. Fig. 8.
Willoughby: B. 1.
Ruysch: Theatr. Tab. VII. Fig. 8.
Zygène, Dutertre: Hist. Nat. II. 207.
Zygaena seu Libella, Jacob: Mus. 16, Taf. VII. Fig. 5.
Jochfisch, Valentini: Mus. Taf. XXXII. Fig. 5.
Zygaena, Ray, 20, 7.
Zygaena: Mus. Besler, Tab. XV. Fig. 1.
Klein: Miss. III. 13, No. 1.
Zygaena, Linné: Mus. Ad. Fr. 52.
Stampella, Scilla: Tab. 28, Fig. 2.
Squalus zygaena, Brünnich: Ichthyol. Massil. 4, No. 8.
Piscis libella, Bonnan: Mus. Kirch. Tab. XXXVII. Fig. 20.
Squalus zygaena, Forskål: Descr. XVIII.
Zygène: Duhamel: Sect. IX. Pl. XXI. F. 3-8.
Gronov. Mus. I. 63, 139.—Zoophyl. 146.
Le Marteau, Brousson. No. 11.

Squalus zygaena. Bloch. 117.
Martillo de Mar, Bru de Ramon. I. 51.
Cornudo, Parra, Lam. 32.
Squalus zygaena, Linné: Syst. 1494.
Squalus, No. 4, Browne: Jam. 558.
Artedi: Gen. Pisc. 44, 7. Synon. 96, 7.
Le Squale marteau, Lacép. I. 257.
Le Squale pantouflier, Ibid. 260, Pl. VII. Fig. 3.
Squalus zygaena, Bl. Schn. 131.
Russell, XII. Koma Sorra. *(Young.)*
Squalus zygaena, Shaw, V. 354, Pl. 154.
Zygaena malleus, Risso: Ichth. 34, Hist. Nat. III. 125.
Sphyrna zygaena, Rafin: Ind. 46.
Squalus zygaena, Mitchill: Tr. Lit. and Phil. Soc. New York, I. 284.
Zygène marteau: Dict. des Sc. Nat. T. 32.
Zygaena malleus: Valenciennes: Mém. du Mus. IX. 223. Pl. XI. Fig. 1. a. b.
Zygaena tudes, Val. Ibid. Pl. XI. Fig. 3. *(Very young.)*
Zygaena malleus, Cuv. R. A. II. 393.
Zygaena tudes, Ibid. 394.
Zygaena lewisii, Griffith: Anim. Kingd. Tab. 50.
Zygaena malleus, Yarrell: II. 406.
Zygaena malleus, Cantor: Quarterly Med. Journ. No. III. Calcutta, 1837, Fig. 1.
Zygaena tudes, Cantor, Ibid. Fig. II. and: Transact. Med. and Phys. Soc. Calcutta: VIII. Pt. 2, Appendix, ccxj. Fig. I-II.
Zygaena malleus, Swainson: I. 134.
Zygaena malleus, Yarrell: Supplem. 61.
Sphyrua zygaena, Bonaparte: Faun. Ital. Fasc. 27.
Zygaena tudes, Agassiz: Recherches: III. Tab. E. Fig. 8, (Teeth.)
Sphyrna zygaena, Müller und Henle, 51.
Sphyrna tudes, Ibid. 53.
Zygaena malleus, De Kay: Zoology of New York, IV. 362. Pl. LXII. Fig. 204. (*Young.*)
Sphyrna zygaena, Richardson: Rep. 1845, 194.
Sphyrna tudes, Bleeker: Verhandel. Batav. Gen. XXII. 6.

Foetus. Head above, back sides and fins rosy white, with a greyish tinge along the back; beneath white. Iris silvery light blue; pupil circular black. Total length: 1 ft. $0\frac{7}{8}$ inch.

Young and Adult. Body and fins slate grey; beneath white. Iris golden.

HABIT.—*Sea of Pinang, Singapore, Malayan Peninsula.*

Coasts of France, English Channel, Mediterranean, Atlantic, Indian Ocean, Bay of Bengal, Java, Madura, China Seas, Japan, Brasilian Coast, Nantucket, Cayenne, South Coast of Australia.

TOTAL LENGTH: 10 ft. 9 inch.

The anterior dorsal commences immediately behind the termination of the pectorals; the extent of the base is considerably less than $\frac{2}{3}$ of the length of the anterior margin; the upper and the posterior margins join in a narrow, not much elongated point. The posterior, much smaller dorsal commences opposite the root of the anal, but terminates a little before the latter; both fins terminate in an elongated narrow point. The distance from the commencement of the ventrals to that of the pectorals is a little less than the distance between the commencement of the ventrals and that of the caudal. The fourth and fifth branchial openings are placed above the commencement of the pectorals. All the teeth are trenchant, not denticulated; those of the upper jaw appear somewhat broader than those of the lower. The scales are very minute with five or six keels. In the adult the anterior margin of the head forms a nearly uninterrupted or slightly festooned arch till it reaches the nostrils, where there is a more or less deep notch. The posterior margin is nearly parallel to the anterior. The nostrils open near the external part of the anterior margin of the head. From the nostrils proceeds a fissure along the external third of the anterior margin of the head. The length of the head, from the angle of the mouth, is about $\frac{1}{3}$ of the breadth, or a straight line drawn between the eyes. The posterior margin of the head forms with the body an acute angle. Single individuals occur at all seasons in the Straits of Malacca. The largest examined was a female taken at Pinang in January 1845. In her were observed thirty-seven living young, of which twenty were males, seventeen females.

All were of the following dimensions:

Length of the head from the angle of the mouth,	$1\frac{4}{8}$ inch.
,, ,, lateral margin of the head,	1
Distance between the eyes,	$3\frac{3}{8}$
,, from the angle of the mouth to anus,	$4\frac{5}{8}$
,, ,, anus to anal fin,	$0\frac{7}{8}$
Base of the anal,	$0\frac{13}{16}$
Height of do,	$0\frac{5}{8}$
Distance from anal to caudal fin,	$0\frac{13}{16}$
Length of caudal,	4
Base of anterior dorsal,	$1\frac{2}{8}$
Height of do.,	2
Base of posterior dorsal,	$0\frac{5}{8}$
Height of do.,	$0\frac{7}{8}$
Length of pectorals,	$1\frac{3}{8}$
Breadth of do.,	$0\frac{9}{16}$
Distance between the nostrils,	$2\frac{1}{8}$
Distance between the angles of the mouth,	$0\frac{6}{8}$

The foetus or very young differs from the adult in its more arched anterior margin of the head, and in the margin itself being more festooned. The length of the head is but little less than one-half of the breadth. From the nostrils proceeds an almost imperceptible fissure, and there is no notch in the anterior margin above them. The posterior margin of the head joins the body at a nearly right angle. (These are the distinguishing characters of *tudes*, Val.) The teeth of the foetus are barely perceptible to the touch. The lateral processes of the head are membranous; but in each appear two narrow cartilaginous tubes, one containing the optic, the other the olfactorian nerve.

Sphyrna blochii, (Valenciennes.)

Bloch: 117.

Zygaena blochii, Valenciennes: Mém. du Mus. IX. Pl. XI. Fig. 2. *(Foetus.)*

Zygaena blochii, Cuv. R. A. II. 393(3).

Zygaena blochii, Bennet; Life of Raffles, 694.

Zygaena laticeps, Cantor: Quarterly Med. Journ. Calcutta, 1837, Pl. 1, 2, 3, *(Young.)*

Zygaena blochii. Ibid. Fig, IV. *(Foetus)* and Transact. Med. and Phys. Soc. Calcutta, VIII. Pt. II. App. ccxi.

Zygaena laticeps, Swainson: I. 134, Fig. 11, and II. 318.

Zygaena blochii, Yarrell: Supplem. 64, Fig. 3, *(Foetus.)*

Zygaena laticeps, Ibid. Fig. 4, *(Young.)*

Sphyrna blochii, Müller und Henle, 54, 199. *(Young.)*

Zygaena blochii, Cantor in Ann. and Mag. of Nat. Hist. 1845. *(Adult and Foetus.)*

Sphyrna blochii, Bleeker: Verhand. Batav. Gen. XXII. 6.

Head, body and fins above bluish- or slate grey; beneath white or pale yellowish. Iris golden; pupil circular, black.

HABIT.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Bay of Bengal, Sumatra, Java, Borneo, Celebes, Madura.

TOTAL LENGTH: 4 ft. 4 inch.

In all ages the head is remarkably broad. The breadth of the head is not only liable to slight individual variations, but also to more considerable variations according to age. In the foetus the length of the head, the distance from the angle of the mouth to the anterior margin of the head is about $\frac{1}{4}$ of the breadth, or the distance between the lateral margins of the head. With age the length diminishes to about $\frac{1}{6}$, which it has been found to be in the largest (adult?) fish yet examined, a female 4 feet 4 inch in length. The variations will be perceived by the following admeasurements.

Total length.	4 ft. 4 in	3 ft. 8 in.	2 ft. 2 in.	1 ft. 11 in.	1 ft. $1\frac{4}{8}$ in.	1 ft. $1\frac{2}{8}$ in.
Breadth of head.	2 ft. $1\frac{4}{8}$ in.	1 ft. $9\frac{4}{8}$ in.	0 ft. $10\frac{5}{8}$ in.	0 ft. $8\frac{5}{8}$ in.	0 ft. 6 in.	0 ft. $4\frac{7}{8}$ in.
Length of do.	... $3\frac{7}{8}$ in.	 $3\frac{5}{8}$ in.	 $1\frac{7}{8}$ in.	 $1\frac{5}{8}$ in.	 $1\frac{2}{8}$ in.	 $1\frac{2}{8}$ in.

A little more than the central third of the anterior margin of the head forms a large slightly undulating arch. At the termination of this arch appear the nostrils. In the foetus and the young the rest of the anterior margin is directed backwards, and the posterior margin joins the body at an acute angle. But in older individuals the anterior margin of the head, from the nostrils, is not directed backwards, and the posterior margin joins the body at a right angle.

The fins are placed as they are in *S. zygaena*, except the posterior dorsal which commences but little in front of the termination of the anal. The following admeasurements were taken from the largest individual, 4 ft. 4 inch in length. She was a female captured at Pinang in September 1844.

Distance between the nostrils,	$9\frac{4}{8}$ inch.
,, between the angles of the mouth,	$5\frac{2}{8}$

She had eighteen living foetus, of which seven were males, eleven females. The lateral processes of the head were in all bent backwards and towards the sides of the body, so as to make the head resemble a broad arrow, as represented by M. Valenciennes. All the foetus were of the following dimensions:

Total length,	$13\frac{4}{8}$ inch.
Length of the head,	$1\frac{2}{8}$
,, lateral margin of the head,	$0\frac{7}{8}$
Distance between the eyes,	6
,, from the angle of the mouth to anus,	5
,, anus to anal fin,	$1\frac{1}{8}$
Base of anal,	$0\frac{7}{8}$
Height of ditto,	$0\frac{5}{8}$
Distance from anal to caudal fin,	$0\frac{6}{8}$
Length of caudal,	$4\frac{3}{8}$
Base of anterior dorsal,	$1\frac{4}{8}$
Height of ditto,	$2\frac{4}{8}$
Base of posterior dorsal,	$0\frac{3}{8}$
Height of ditto,	$0\frac{4}{8}$
Length of pectorals,	$1\frac{6}{8}$
Breadth of ditto,	$1\frac{1}{8}$
Distance between nostrils,	2
,, angles of the mouth,	$0\frac{7}{8}$

In January 1845 another female occurred, 3 ft. 8 inch. in length, with fifteen living fœtus. Of these ten were males, five females, all of which measured one foot in length. Young individuals, upwards of 3 ft. in length, are very numerous at all seasons in the Straits of Malacca. In the Bay of Bengal, in 21° N., the species is of rarer occurrence. The young feed on crustacea, the older on fishes.

Sub-ordo : RAJAE.

Fam. SQUATINORAJOIDÆ.

Gen. Pristis, (*Latham*, 1794,) *Müller und Henle*, 1841.

(Pristibatis, *Blainville*, 1828.)

Teeth of the saw generally uniform, flattened and trenchant, directed tolerably straight outwards, and commencing in front of the nostrils. Nostrils far removed from the mouth, with a long, narrow triangular valve at the upper margin ; at the lower margin a hemlike valve. No cartilages at the angle of the mouth. Mouth transversal, straight. In the upper jaw a membranous transverse valve behind the teeth, with a straight margin. Teeth flattened, like paving stones. Upper eyelid without projection. Spiracles large, separated by a broad bridge from the eyes. Anterior dorsal partly opposite the ventrals. Both dorsals equal. Caudal short, with or without a lower lobe.

Pristis semisagittatus, (Shaw.)

Russell, XIII. Yahla (*Very young.*)

Squalus semisagittatus, Shaw, V. 361.

Pristis semisagittatus, Cuv. R. A. II. 394 (3).

Pristis semisagittatus, Swainson, II. 319.

Pristis semisagittatus, Müller und Henle, (*Young,*) 108, Taf. (Mouth and nostrils).

Ikan garagáji of the Malays.

Diluted yellow ochre; beneath whitish. Iris pale golden; pupil black, transversely oval.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Coromandel, Bay of Bengal, Mouths of the Ganges.

Total length : 6 ft. 4 inch.

The nostrils are situated very near the mouth and extend close to the margin of the snout; from their external angle proceeds a short fissure towards the margin of the snout. The transversal duplicature or valve behind the teeth of the upper jaw has a deep notch at the symphysis of the jaw, and the margin is fringed in young individuals, as described by M. M. Müller and Henle. But in older ones (3 ft.

6 inch. in length,) the margin is smooth. The two dorsal fins are of equal size and form, the superior margin is very concave, and terminates in a narrow elongated point. In young individuals they join at an acute angle. The anterior dorsal commences opposite the termination of the ventrals; the distance from the termination of the posterior dorsal to the commencement of the caudal exceeds by one-half the base of the dorsal. The posterior margin of the caudal is deeply excavated so as to form a lower lobe, but little smaller than the upper. On the tail there is a sharp keel where the abdomen joins the sides; the keel is particularly raised between the posterior dorsal and caudal. The male appendages are styliform and project slightly beyond the inner margins of the ventrals, to which the anterior two-thirds are joined. The ventrals terminate in an elongated point. The external margin of the pectorals is concave. The anterior branchial opening is situated immediately beneath the commencement of the pectorals, the rest follow an oblique backwards and inwards direction. With the exception of the apex of the male appendages and the teeth of the saw, every other part of the body is covered with minute rounded or irregular scales, of unequal size. The back is rough to the touch in consequence of numerous tubercular scales, a little larger than the rest. All the scales have originally a minute central tubercle which, however, soon becomes worn. In the fœtus the lateral margins of the saw are smooth and not yet pierced by the teeth. At the base the saw is naked to within a considerable distance (from 3 to 5 longitudinal diameters) of the eye. The first two or three teeth on each side of the apex of the saw are placed regularly opposite each other, the succeeding ones are not so. One of the margins carries from 4 to 7 more teeth than the other. The greater number present on one side varies from 25 to 34. In very young individuals, such as have been described by Russell and M. M. Müller and Henle, upwards of 3 ft. in length, each tooth has at the posterior margin a notch which forms a small barb, behind which the base of the tooth becomes narrower. But in individuals of about 4 ft. in length the notch is nearly effaced, and the basal half of the tooth is much broader than the other tapering half, which appears, as if it had been filed. With age the teeth become broad at the base, with trenchant margins tapering to a rounded trenchant point. The anterior margin is arched and

slightly directed backwards. The apical half of the teeth is slightly depressed. *Crustacea* form the food of the young, of which single occur in the Straits of Malacca at all seasons. Large individuals are seldom seen.

Gen. Rhina, (*Klein*, 1745,) *Müller und Henle*, 1841.

Snout rounded; spiracles immediately behiud the eyes. Both the superior and inferior nasal valve extend to the inner angle of the nostril. Mouth deeply undulating. Teeth almost globular, not broader thau long.

Rhina ancylostomus, Bloch-Schneider.

Rhina ancylostomus, Bloch-Schneider, 352, Tab. 72.
Rhina ancylostomus, Cuvier, R. A. II. 396 (3).
(Icon.) Rhina ancylostomus, Gray: Ill. Ind. Zool. II. Pl. 102, Fig. 2. (Teeth.)
Rhina ancyclostomus, Swainson, II. 322.
Rhina ancylostomus, Agassiz: Tab. H. Fig. 3, 4. (Teeth.)
Rhina ancylostomus, Owen: Odontogr. Pl. 23. (Teeth.)
Rhina ancylostomus, Müller und Henle, 110. (Very young.)
Rhina ancylostomus, Richardson: Report, 1845, 195.

Above earth-brown or deep skyblue; on the back, pectorals and caudal numerous distant whitish spots; beneath white. Iris pale golden; pupil black, transversely oval.

Habit.—*Sea of Pinang.*

Indian Ocean, Madras, China Sea.

Total length: 7 ft.

The distance between the nostrils exceeds the length of each nostril by about $\frac{1}{6}$. The distance of the nostrils from the margin of the head is $\frac{1}{3}$ of their length. The horizontal diameter of the eye, which slightly exceeds the vertical, is a little more than $\frac{1}{3}$ of the length of the nostril. The spiracles are nearly ovoid, their longest diameter $\frac{1}{2}$ of the length of the nostrils; their distance from the eye is about $\frac{1}{2}$ of its horizontal diameter. The pectorals, by far the largest of the fins, appear triangular and are nearly equilateral; the anterior convex margin is thickened, rounded and smooth; the posterior is straight and coarsely serrated. The branchial openings in position and form resemble those of *Pristis semisagittatus*. The anterior dorsal commences a little in front of the

ventrals and terminates a little before the termination of the latter fins. The base scarcely exceeds one-half of the height of the fin; the anterior margin is convex, the two others nearly straight; the angles are acute. The posterior dorsal is scarcely smaller than the anterior, which it resembles in form; it occupies the centre of the distance between the termination of the anterior dorsal and the commencement of the caudal. The posterior margin of the caudal is deeply excavated, and there is a lower lobe but little smaller than the upper. The caudal keel commences beneath the posterior dorsal fin. The ventrals resemble the anterior dorsal in form and size, but the posterior margin is excavated. The male appendages extend as far as the termination of the base of the posterior dorsal. The outline of the base of each tooth is rhomboidal, with the horizontal diameter slightly exceeding the vertical. The external surface is globular, covered with minute transverse undulating furrows. The largest teeth are situated on the two protuberances of the upper- and the three of the lower jaw. Immediately behind the teeth of the upper jaw, appears a transversal duplicature or valve, with a smooth margin, but with a notch under the symphysis of the jaw. The valve, the palate and the flattened rounded tongue are all covered with scales like those of the rest of the body. They are very minute and consist of a triangular keel, rooted in the integuments, but projecting beyond them in an oblique backwards direction. Near the point the keel expands and presents a minute rhomboidal surface, so that the entire scale resembles the arm of an anchor with its fluke and peak. In many places the scales are worn down, become smooth and granular, and lose their original form. Larger and different scales are distributed in regular conspicuous crests. Of the latter there are two of an oval shape, placed obliquely, a little in front of and higher up than the eyes. Immediately behind this pair commences a second, each of which borders the supraciliar margin, and extends a little behind the upper margin of the spiracle. From each of the supraciliar crests proceeds a smaller narrower one downwards, bordering the anterior part of the orbit. From the centre between the supraorbital crests commences the dorsal, the longest of all, which extends to opposite the termination of the pectorals. Each scapular region carries a superior and an inferior crest, both of which are narrow and placed parallel to the dorsal crest. The superior is $\frac{1}{3}$, the inferior

$\frac{1}{6}$ of the length of the dorsal crest. A very short crest appears at the lower circumference of each spiracle. The crests are composed of single scales larger than the rest. All have a polygonal base from which rises a compressed thorn, from the apex of which numerous furrows radiate towards the base of the sides. On the snout, above and beneath, appear a number of pores. Opposite the spiracles, a little in front of the dorsal crest, the integuments are pierced by two large pores, placed side by side. The distance between these two is about one half of the distance from each to the nearest supraorbital crest.

The following dimensions were taken from a male, measuring 7 ft. in length.

Distance from the apex of the snout to the mouth, ..	0 ft.	$6\frac{6}{8}$ inch.
,, from the mouth to the middle between the terminations of the pectoral fins, ...	1	6
,, from thence to the anus, ...	1	0
,, from the anus to the caudal.	2	$3\frac{6}{8}$
Length of the upper lobe of the caudal, ...	1	6
,, of the lower lobe of ditto, ...	1	$1\frac{1}{8}$
,, of the base of the anterior dorsal, ...	0	$5\frac{4}{8}$
Height of the fin, ...	0	$10\frac{4}{8}$
Length of the base of the posterior do.....	0	$4\frac{7}{8}$
Height of the fin, ...	0	10
Distance between the anterior angles of the pectorals,	3	$8\frac{4}{8}$
Length of the base of the pectorals,.....	1	$2\frac{4}{8}$
,, of the base of the ventrals,.....	0	$4\frac{4}{8}$
,, of the male appendages, ...	1	2
Breadth of the mouth, ...	0	7
Length of the supraorbital crests,.....	0	$8\frac{5}{8}$
,, of the dorsal crest, ...	1	4
Greatest diameter of the nostril, ...	0	$4\frac{5}{8}$
,, of the eye,.....	0	$1\frac{6}{8}$
,, of the spiracle,.....	0	$2\frac{1}{8}$

The description of M. M. Müller and Henle is taken from a very young individual. During four years three solitary individuals occurred at Pinang. According to Lord Arthur Hay and Mr. Walter Elliot they are of more frequent occurrence at Madras. Mr. Elliot, who has observed the habits of the fish, describes it as hugging the shore,

moving slowly along the bottom. Hence the Tamil name: "*Mann Ulavi*," i. e. "Mud-skate." In some dissected, Mr. Elliot observed fragments of *Crustacea* in prodigious quantities.

Gen. Rhynchobatus, *Müller und Henle*, 1839.

Snout elongated, acute, with a tapering keel along the middle. The interval between the keel and the inner margin of the pectorals is membranous; spiracles immediately behind the eyes. Upper eyelid with a simple projection. Upper and lower nasal valve extend but halfway to the internal angle of the nostril; outside in front, at the upper margin of the nostril is a narrow hem. The undulations of the snout, particularly the lateral ones, are shallow. Teeth broader than long, with a transversal protuberance. A transversal arched row of pores on the abdominal surface of the scapular region.

Rhynchobatus djeddensis, (Forskål.)

Duham. Sect. IX. Pl. 15.
Raja dsiddensis, Forskål: Descr. 18.
Raja dsiddensis, Linné: Syst. 1511.
Rhinobate rhinobate, Lacépède, I. Pl. VI.
Raie bohkat, Lacép. I. 139.
Rhinobatus laevis, Bloch-Schneider, Tab. 71 *(Young.)*
Russell, X. Walawah Tenkee *(Young.)*
Raja djiddensis, Shaw, V. 319.
Rhinobate lisse: Dict. des Sc. Nat. 19.
Rhinobatus laevis, Cuvier, R. A. II. 396(').
Rhinobatus djeddensis, Rüppell: Atlas, 54, Taf. 14, Fig. 1.
Rhinobatus djeddensis, Bennett: Life of Raffles, 693.
Rhinobatus djettensis, Rüppell: Neue Wirbelth. Fische, 68.
Rhinobatus duhamelii, Blainville: Faune. Fr. 148.
Rhinobatus laevis, Swainson, II. 322.
Rhynchobatus laevis, Müller und Henle, 111.

(Young.) Above light greenish olive, pale yellowish- or reddish brown, with a downwards arched black band on the upper eyelid; a small black spot on each side of the point of the snout; a large oval black spot surrounded by several white (from 3 to 6) ones above the middle of the base of the pectorals, and with more or less numerous white spots on the pectorals and the sides, where in some they are dis-

posed in longitudinal lines ; sides of the snout, pectorals and ventrals in some tinged with carmine ; beneath whitish. Iris golden ; pupil transversely oval, black. (Bloch-Schneider.—Russell, X.—*Var.* 2, Müller und Henle.)

Var. 3. Müller und Henle.—With numerous round spots on the snout, head, back, tail and pectorals. (*Rhinobatus djeddensis*, Rüppell.)

(Adult.) Either uniformly coloured, or with indistinct spots ; but without spots at the point of the snout, and without bands on the upper eyelid.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Indian Ocean, Bay of Bengal, Red Sea.

Total length : 5 feet.

Spiracles with two denticulations at the posterior margin. The length of the snout is a little less than $\frac{1}{7}$ of the total. The distance of the nostril from the lateral margin is $\frac{1}{4}$ of the length of the nostril. The distance between the anterior extremities of the nostrils is double the length of each nostril; the distance between the posterior extremities is a little less than the length of each nostril. The anterior dorsal commences a little behind the commencement of the ventrals, and extends a little farther back than the latter. The extent of the base is less than one half of the anterior margin. The posterior dorsal is smaller ; its distance from the caudal is a little more than one half of the distance from the anterior dorsal. Both dorsals are similar, terminating in an attenuated point, but the posterior is much the smaller. The extent of their base is less than one half of their anterior margin. The pectorals appear triangular. The ventrals terminate in an attenuated point, which extends to the opposite point of the anterior dorsal. The posterior margin of the caudal is very concave ; the lower lobe but little smaller than the upper. The lateral keel commences a little above the termination of the ventrals. The scales are very minute subrhomboidal or orbicular and imbricated ; they carry from 3 to 6 keels. A number of small recurvous spines are at intervals distributed in lines. One such, the supraorbital, surrounds the anterior part of the orbit, and extends backwards to above the spiracle. Another, the dorsal, extends along the spine to the posterior dorsal. As in *Rhina ancylostomus*, there appear two conspicuous pores a little in front of the dorsal line. In young individuals these pores are less distinct. A

little behind the occiput, on each side, appears a short backwards diverging line of spines. Each shoulder carries a second, a little longer, also directed backwards. In large individuals there is another line beneath the scapular. It consists but of two or three spines.

The following dimensions were taken from a female 4 ft. $1\frac{6}{8}$ inch in length.

From the snout to the mouth,	0 ft.	$8\frac{6}{8}$ inch.
From the mouth to the anus,	1	3
From the anus to the caudal,	1	6
Length of the caudal,	0	8
Distance between the anterior angles of the pectorals,	1	$3\frac{1}{8}$
From the snout to the eyes,	0	$7\frac{5}{8}$
Distance between the orbits,	0	$2\frac{1}{8}$
,, between the internal angles of the nostrils,	0	$1\frac{7}{8}$
Breadth of the mouth,	0	3
From the point of the snout to the end of the base of the pectorals,	1	$6\frac{4}{8}$
Greatest breadth of the keel of the snout	0	$1\frac{5}{8}$
Distance between the dorsals	0	9
,, between the posterior dorsal and caudal	0	$5\frac{6}{8}$
,, between the pectorals and ventrals,	3	

Single individuals occur at all seasons in the Straits of Malacca.

Gen. Rhinobatus, (*Bloch-Schn.* 1801) *Müller und Henle*, 1841.

Skull elongated in a keel, the interval between which and the internal margin of the pectorals is membranous ; snout more or less pointed. The upper nasal valve consists, as in *Rhynchobatus*, of an external narrow elongated lobule, and an internal which is broader and shorter. The external lobule is narrow, but its rounded apex extends to the lower margin of the nostril, and does not project at an angle from the inner lobule. The external lobule is situated nearly in the middle of the upper margin of the nostril ; the internal lobule extends more or less inwards. The lower nasal valve extends from the external angle more or less inwards. Spiracle and eye surrounded by a common fleshy wall. The upper eyelid carries in the centre a projection. The valve of the upper jaw has a fringed margin and is notched in the centre. The anterior part of the lateral margin of the disk has two slight undulations.

Sub-Gen. Rhinobatus, *Müller und Henle*, 1841.

The upper nasal valve does not extend to the inner angle of the nostril.

Rhinobatus (Rhinobatus) ligonifer, Cantor.

Plate XIV.

(Young ?) Keel of the snout, head, body and fins above greenish ash-grey; snout and abdominal surface white. Iris pale golden of the general colour; pupil broad cordate, black.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Total length: 1 foot $4\frac{6}{8}$ inch.

This species greatly resembles *Rhinobatus thouini*,* but differs from the latter as described by M. M. Müller and Henle, in the following characters. The lateral margins of the snout, a little from the apex are deeply bent inwards, and nearer the apex they are similarly, but less distinctly, bent a second time. The apex thus somewhat resembles the figure **8**. The keel is not smooth, but covered to the very point with small distant recurvous thorns, like those of the rest of the upper part of the body. The shallow furrow of the keel extends considerably in front of the eyes. Each spiracle carries two distinct denticulations. The pectinations of the nostrils vary from 85 to 90, (in *R. thouini* about 60). The teeth vary from 75 to 80 in a series (in *R. thouini* about 60). The scapular region carries an outer-, and a larger inner thorn. In *R. thouini* the inner thorn is the smaller of the two.

The keel is most contracted a little in front of the eyes, the breadth being about $\frac{1}{18}$ of the length. From thence it slowly widens towards the 8-shaped apex, which is about $\frac{1}{4}$ of the length of the keel. The shallow lanceolate furrow commences between the eyes and extends as far beyond them as the basal sixth of the keel. The posterior margin of the spiracle carries a smaller internal, and a larger external denticulation. The distance between the nostrils is one half of the length of each nostril, and it slightly exceeds the distance between the lateral

* *Raje thouin*, Lacép. I. Pl. 1, Fig. 3-5.—*Raja thouiniana*, Shaw: V. 318. Pl. 147.—*Rhinobatus thouin*, Cuv. R. A. II. 396. (2).—*Rhinobatus (Rhinobatus) thouini*, M. und H. 120.

margin of the head and the nostrils. The upper nasal valve extends as far as the inner third of the margin. The distance between the orbital thorns exceeds by $\frac{1}{3}$ the length of the orbit and spiracle together. The pectoral fins are rounded. The ventrals are subrhomboidal, terminating in an acute point; the male appendages are somewhat shorter than the inner margins. The posterior dorsal is very little larger than the anterior. The lateral keel commences a little behind the ventrals. The upper surface of the snout, body and fins is covered with small distant scales. They are all directed backwards, and resemble those of *Rhina ancylostomus*. The keel of the snout and the upper surface of the head are covered with minute thorns. Three to five larger thorns border the anterior margin of the orbit; two the inner margin of the spiracle. The largest thorns are placed at intervals along the spine of the back, and the line extends as far as the posterior dorsal fin. In front of the dorsal series appear two pores, as in *Rhina ancylostomus*. In each scapular region appears an isolated thorn, and outside of that a second smaller one. The thorns are all compressed, with a broad oval base with radiating lines. The lower surface of the snout is covered with minute somewhat distant scales, which are triangular, with the apex directed backwards. Those of the rest of the lower surface are nearly round, with an indistinct central tubercle. The abdominal surface of the scapular region is on each side marked by an undulating linear furrow. The cavity of the mouth and the large flattened tongue are covered with minute triangular scales. The membranous valve behind the teeth of the upper jaw has a large notch in the centre and a smaller one at each angle of the mouth. The margins of the smaller notches are fringed.

The following dimensions were taken from a female 1 ft. $4\frac{6}{8}$ inch in length.

From the snout to the internal angle of the nostril, ...	$3\frac{6}{8}$ inch.
From thence to the mouth, ...	$0\frac{2}{8}$
From the mouth to the anus, ...	$3\frac{6}{8}$
From the anus to the point of the caudal, ...	9
Distance between the nostrils, ...	$0\frac{4}{8}$
Length of the nostrils, ...	1
Breadth of the mouth.	$1\frac{2}{8}$
Greatest breadth of the disk, ...	$5\frac{3}{8}$

Distance from the ventrals to the anterior dorsal, ... $1\frac{6}{8}$
,, between the dorsals, ... $1\frac{4}{8}$
,, between the posterior dorsal and the caudal, .. $0\frac{6}{8}$
Length of the caudal, ... $2\frac{3}{8}$

Solitary individuals occur during all seasons in the Straits of Malacca.

Platyrhina* sinensis, Müller und Henle, occurs, but rarely, at Singapore and Pinang.

Fam. TORPEDINIDÆ.

A. With two dorsal fins.

Gen. Narcine, *Henle*, 1834.

Disk orbicular, elliptical or angulated, rounded in front and provided with a broad keel. Mouth small, protractile, surrounded by a circular skinny fold, which terminates above in the frænulum† of the nasal valve. Nasal valve straight, with a central projection, and sometimes with the lateral projections slightly elongated, making the valve trifid. A labial cartilage above and beneath. Teeth in quincunx, with a point in the middle. They project beyond the margin of the jaw like an elliptical plate. The lips not fixed to the jaws, but moveable. A membranous valve behind the upper jaw. Tail longer than the disk. The anterior dorsal behind the ventrals, smaller than the posterior. Spiracles immediately behind the eyes. Margins of the spiracles smooth.

Narcine indica, Henle.

Narcine indica, Henle: Narcine, 35, Taf. II. Fig. 2.
Narcine indica, Müller und Henle, 130.
Pari kubbas of the Malays.

Body and fins above light reddish brown or copper-coloured, with numerous larger and smaller chocolate-coloured spots, in young indivi-

* Pre-occupied by *Platyrhinus*, Clairville, 1798. *(Coleopt.)*

† "Bändchen."

duals broadly edged with silvery white. The spots generally circular, some oval, others confluent. Beneath whitish. Iris narrow golden; pupil triangular, with the apex downwards, black; margins of the spiracles flesh-coloured.

Habit.—*Sea of Pinang.*

Tranquebar.

Total length: 1 ft. 6 inch.

The disk has a pentagonal appearance and is but very little broader than long. The tail is slightly longer than the body. In very young individuals it is a little shorter than the body. The ventrals are not covered by the pectorals; their angles are acute, their anterior margin slightly concave. The male appendages project but slightly beyond the inner margin of the ventrals. The anterior dorsal commences opposite the termination of the ventrals. In the young the apex forms an acute angle, later it becomes rounded. The extent of the base is $\frac{1}{2}$ of the length of the anterior margin. The distance between the two dorsals equals that between the posterior and the caudal. Both dorsals are of similar form and size. The posterior margin of the caudal is very convex. The following dimensions were taken from a female, measuring $11\frac{1}{8}$ inches in length.

From the snout to the mouth,	$1\frac{6}{8}$ inch.
From the mouth to the anus,	$3\frac{6}{8}$
From the anus to the point of the caudal,	$5\frac{5}{8}$
Length of the disk,	$5\frac{2}{8}$
Breadth of the disk,	$5\frac{4}{8}$

Large individuals are at Pinang of rare occurrence, but younger, from 3 to 6 inches in length, are taken at all seasons. In or out of water they may be handled with impunity. Several species of fishes introduced in a jar filled with sea-water and containing a large *Narcine* shewed no consequences from the contact, nor did they appear to avoid the Torpedo. The food of this and the other Malayan *Torpedinidæ* consists of *Crustacea* and *Testacea*.

B. With one dorsal fin.

Gen. Astrape, *Müller und Henle*, 1837.

Snout short without keel, generally similar to that of *Narcine*. Frænulum of the nasal valve with a cylindrical cartilage. Teeth

pointed with a tetragonal base, but slightly projecting beyond the margin of the jaw. A membranous valve in both jaws. The solitary dorsal and the caudal rounded. Eyes close to the spiracles. The latter smooth.

ASTRAPE DIPTERYGIA, (Bloch-Schneider.)

Raja dipterygia, Bloch-Schneider, 359.

Torpedo dipterygia, Var. Olfers. Torp. 25.

Narcine dipterygia, Henle: Narcine: Taf. III. Fig. 2.

Astrape dipterygia, Müller und Henle: 131. *(Young.)*

Pari kubbas of the Malays.

Above dark greenish olive, with a large round whitish spot on each side at the posterior margin of the disk; anterior half of the ventrals whitish; a large round whitish spot on each side above the termination of the ventrals, a similar one on each side of the root of the caudal; dorsal and caudal blackish brown or black; beneath whitish. Iris golden; pupil circular black.

In the very young (upwards of $4\frac{2}{8}$ inch in length) the ventrals are of a uniform colour like the ground-colour.

HABIT.—*Sea of Pinang, Malayan Peninsula, Lancavy Islands, Singapore.*

Tranquebar.

TOTAL LENGTH: 8 inch.

The disk is rounded, and as broad as long. It covers the anterior margin of the ventrals. The latter are tetragonal, with acute angles in the young, but later they become obtuse. The male appendages are strong and extend to opposite the termination of the dorsal. The latter commences at the posterior third of the length of the fish. The eyes are much smaller than the spiracles. The following dimensions were taken from a male $6\frac{1}{8}$ inch in length.

Length and breadth of the disk,	3 inch.
From the snout to the mouth,	$0\frac{5}{8}$
From the mouth to the anus,	$2\frac{2}{8}$
From the anus to the apex of the caudal,	$3\frac{2}{8}$

Single individuals occur in the Straits of Malacca at all seasons.

C. Without dorsal fins.

Gen. Temera,* *Gray*, 1831.

Body orbicular; ventral fins large, produced, nearly square; tail very short, and compressed, finned; dorsal fin none; most nearly allied to *Torpedo*, but differs in having no dorsal fin, in which character it is most nearly allied to *Narke* of Caup, a genus not noticed by Cuvier, which has only one dorsal fin, while *Torpedo* has two.

Temera hardwickii, Gray.

Plate XII, Fig. 1-2.

Temera hardwickii, Gray: Zool. Misc. 7. (*Young.*)

(*Icon.*) Temera hardwickii, Gray: Ill. Ind. Zool. II. Pl. 102. (*Young.*)

Temera hardwickii, Müller und Henle, 131, Taf. Fig. 1, (Mouth and Teeth.)

Pari kubbas linchin of the Malays.

Above light yellowish brown; margins of spiracles flesh-colonred; whitish beneath. Iris golden; pupil transversely oval, black.

In some the disk and tail above have large irregular white patches. (*Var.* 2. M. und H.)

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Total length: 1 ft. 6 inch.

The disk is nearly round, but the snout between the eyes appears truncated. The relative proportions of the length and breadth appears to be liable to slight individual variations. In some the disk is a little longer than it is broad, in others vice versâ. The eyes are as large as the spiracles. The ventrals are not covered by the pectorals. The following dimensions were taken from a female $4\frac{1}{8}$ inch in length.

From the snout to the mouth,	$0\frac{3}{8}$ inch.
From the mouth to the anus,	$2\frac{1}{8}$
From the anus to the point of the caudal,	$1\frac{5}{8}$
Length of the disk,	$2\frac{3}{8}$
Breadth of the disk,	$2\frac{4}{8}$

* "Snout, mouth and membranous valve of the jaws as in *Astrape*. Tail without dorsal fin, short in proportion to the disk. Spiracles immediately behind the eyes, smooth. Teeth flattened." (*Müller und Henle*, page 131.)

She had four foetus, each $1\frac{1}{8}$ inch in length, in colour and form resembling the mature fish. But the vertical diameter is in the foetus proportionally greater. In the Straits of Malacca this species is at all seasons very numerous.

The electric organs (Pl. XII. Fig. 1, *a. a.*) are of an elongated tetragonal arched form, and occupy the sides of the disk. They occupy the space between the snout and the abdominal cavity, their internal concave margin bordering the branchial apertures. The length of each is a little more than $\frac{1}{3}$ of the length of the fish, and each occupies a space about double that of the abdominal cavity. Each organ is composed of a number of pentagonal or hexagonal cells, filled with a transparent colourless fluid. The anterior and external margins are surrounded by a bundle of cartilaginous fascicles (*b.*), outside of which appears a long cutaneous nerve (*c.*), from which proceed at right angles a number of small branches towards the external margin of the pectoral fins. The abdominal cavity (*d.*) is remarkably reduced. The intestinal canal, from the entrance of the Ductus coledochus, measures $\frac{1}{4}$ of the total length of the fish. The liver consists of two large, elongated lobes. Beneath the anterior part of the right lobe appears the small oval gall-bladder. The small linear spleen is attached to the major arch of the stomach, close to the pylorus.

Plate XII. Fig. 2 represents the brains, viewed from above. Immediately behind the spiracles (*a.* the left,) appear two branches of *Trigeminus*. The anterior (*b.*) proceeds along the anterior margin of the electric organ, the posterior (*c.*) also supplies the anterior part of the organ. The posterior part of the organ is supplied by two very large branches of *Pneumogastricus* (*d. e.*).

Many of these fishes are infested by minute *Entozoa*. They occupy the cellular tissue immediately beneath the integuments of every part of the body, the electric organs not excepted. It is a *Cysteocercus*, barely perceptible to the naked eye.

Cysteocercus temeræ, Cantor. (Pl. XII. Fig. 3.) Of a pyriform shape. From the oval bladder proceeds the conical, elongated neck, which terminates in a pore, surrounded by recurvous spines. The colour is hyaline with numerous brownish dots ; the cavity of the bladder is pale greenish. The figure is magnified, as it appeared under $\frac{1}{20}$ single lens.

Fam. TRYGONISIDÆ.

A. Tail without spine.

Gen. Rhachinotus,* *Cantor.*

(Equivalent to Anacanthus, *Ehrenberg*, 1837.*)*

Teeth flattened. Tail without radiated fin, but with a skinny hem beneath, or naked.

Rhachinotus africanus, (Bloch-Schneider.)

Raja africana, Bloch-Schneider, 367.

Anacanthus africanus, Müller und Henle, 157.

Above greenish white; beneath white. Iris golden greenish; pupil triangular, black.

Habit.—*Sea of Pinang.*

Guinea, Red Sea.

The disk is rounded, a little narrower towards the tail than towards the slightly projecting pointed snout. A space about 4 inches in breadth, comprising the snout, forehead and the pectoral fins, is free from scales, but sparingly covered with distant thorns. The latter, of which none exceed $\frac{1}{8}$ inch in height, stand erect on a rounded or oval radiated base. The head from between the eyes, the back and the anterior two-thirds of the tail, (the latter above and beneath,) are thickly covered with small heart-shaped scales. Their surface is smooth, obliquely raised towards the apex, which is generally directed inwards to the mesial line of the body. Their margin is abrupt, with three or four concentric lines or strata. Between the scales are scattered a number of single thorns, the longest of which are about $\frac{3}{16}$ of an inch. Their base is stellate, with three to five roots fitting into the intervals between the nearest scales. The thorns are generally erect, but those of the posterior part of the back and of the tail are directed slightly backwards. On the upper part of the anterior fifth of the tail the thorns cease. The tail is compressed, gradually tapering to a narrow point, and densely covered with scales as far as the posterior third, where they become few and far between. The abdominal surface of the tail, as far as the thorns extend, is broad, convex; the rest is acute and

* Ῥάχος thornbush; νῶτος back. Substituted for *Anacanthus*, Ehrenberg, 1837, pre-occupied by *Anacanthus*, Gray, 1831, (*Pisc.*) and *Anacanthus*, Serville, 1832, (*Coleopt.*)

presents a naked, indistinct, skinny hem. The abdominal surface of the body is smooth, naked.

Length from the point of the snout to the mouth, ..	0 ft.	$2\frac{6}{8}$ inch.
From the mouth to the anus, ...	1	$0\frac{5}{8}$
From the anus to the apex of the tail, ...	1	$7\frac{1}{8}$
Distance between the eyes, ...	0	$2\frac{5}{8}$
Greatest breadth of the disk, ...	1	4

A single female occurred at Pinang in December 1843.

GEN. TRYGON, (*Adanson,*) *Müller und Henle* 1841.

Disk oval or rhombic; tail as long as the body or longer, without hem, or with hems not extending to the apex. Mouth a little arched. Teeth with a central point or transversal tubercle, which in some is rough, with a more or less distinct transversal furrow in front and behind; the furrow of the lateral teeth becomes more distinct. The whole surface is more or less wrinkled. Membranous valve of the upper jaw with a straight, deeply fringed margin; a second posterior valve deeply notched. In the lower jaw behind the teeth appear generally several papillæ.

A. Tail without fin.

TRYGON UARNAK, (Forskål.)

Raja ommes scherit, Forskål, Descr. IX.
Raja uarnak, ibid. 18, No. 16, b.
Raja uarnak, Linné: Syst. 1509.
Raja uarnak, Bloch-Schn. 364.
Pastinachus uarnak, Rüppell: Neue Wirbelth. Fische, 69, Taf. 19, Fig. 2. a. b.
(*Icon*). Trygon russelli: Gray: Ill. Ind. Zool. II. Pl. 100.
Trygon variegatus, McClelland: Calcutta Journal of Nat. Hist. I. 60, Pl. II. Fig. 2.
Trygon uarnak, Müller und Henle, 158.*
Trygon uarnak, Var. 1, Müller und Henle, 158 } (*Adult.*)

* M. M. Müller and Henle, quote as synonymes:

"Trygon uarnak,
"Trygon omescherit, } Rüppell, Atlas, p. 51."

The quotation, which has been repeated by Sir John Richardson, l. c., is a mistake. The two names occur neither in page 51, nor in the "Alphabetisches Verzeichniss" of Dr. Rüppell's Atlas.

Trygon uarnak, Var. 2, 3, 4, Müller und Henle, 158 (*Young*).
Trygon uarnack, Richardson: Report, 1845, 197.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Indian Ocean, Red Sea, Bay of Bengal, Mouths of the Ganges, China Sea, Cape of Good Hope.

(*Young.*) Body above light reddish brown or greenish-olive, with numerous black spots, between which the ground-colour appears like a network; beneath whitish; tail brownish white with numerous black rings or transversal bands. (Disk 6 to 9 inch. broad.—*Var.* 2 and 4, M. u. H.)

(*Older.*) Brownish- or greyish- olive with numerous whitish spots; posterior part of tail in some with indistinct blackish or whitish rings. (Disk 3 ft. broad.—*Var.* 3, M. u. H.)

(*Adult.*) Uniformly brownish- or greenish- olive. Iris golden; pupil transversely oval.

In the very young individuals the eyes are very prominent and project above the level of the spiracles. The skin is naked, and in the centre of the back appears but a single heart-shaped white tubercle. In a spotted individual, 9 inches broad, there is a second smaller heart-shaped tubercle behind the former, and the head and the sides along the spine of the back are scantily covered with minute distant heart-shaped scales, which on the root of the tail are placed in a double longitudinal series. On the tail appear numerous very minute, distant thorns, which later disappear. In older individuals (upwards of 3 ft. broad,) the head, back and sides and the anterior half of the tail are covered with smooth orbicular scales, the intervals between which are filled with many smaller than the rest.

The disk is a little broader than long. The distance from the point of the snout to the centre between the nostrils exceeds by one third the distance between the nostrils. The snout is more prominent in the young than in the adult. The tail is compressed towards the spine, the rest cylindrical, tapering to a thin point. Its length is about four times that of the body. On the lower surface appears a very indistinct skinny hem. The spine is situated at the termination of the anterior seventh or ninth of the tail. Its length is liable to considerable individual variations. The following dimensions were taken from a young male, (*Var.* 3, M. u. H.)

From the snout to the mouth,	0 ft.	$3\frac{4}{8}$ inch.
„ mouth to the anus,	1	$0\frac{4}{8}$
Length of the tail,	5	$3\frac{5}{8}$
Greatest breadth of the disk,	1	$10\frac{4}{8}$
Distance between the nostrils,	0	$1\frac{4}{8}$
„ „ eyes,	0	3
„ from the snout to the eyes,	0	$3\frac{4}{8}$
Breadth of the mouth,	0	$1\frac{5}{8}$

Young individuals of this species are numerous at all seasons in the Straits of Malacca, but larger ones, with the body about 4 ft. in length, are uncommon.

Trygon imbricata, (Bloch-Schneider).

Raja imbricata, Bloch-Schn. 366.

Russell, IV. Isacurrah Tenkee. (*Very young.*)

Cuv. R. A. II. 399 (*).

Trygon imbricata, Müller und Henle, 164.

Trygon imbricata, Bleeker: Verh. Batav. Genoots. XXII. 6.

Above lighter or darker brown; the tail in some lighter than the body; beneath white. Iris golden; pupil transversely oval.

Habit.—*Sea of Pinang, Singapore, Malayan Peninsula.*

Bay of Bengal, Java, Madura.

The snout is acutely pointed; the disk is of equal length and breadth; the external and the posterior angle of the pectorals are rounded. The distance between the nostrils is less than one half of that from the snout to the centre between the nostrils. The tail is but little longer than the body. The head from between the eyes is covered with minute, somewhat distant scales. They are heart-shaped, of unequal size, with the apex directed towards the snout. On the back appears an irregularly oval patch of similar scales, with their points directed towards the tail. Between the occiput and the scapular region appear a series of single scales larger than the rest. The anterior fourth of the tail is compressed and above covered with scales like those of the back, with a mesial line of distant lanceolate scales, which gradually increase in length towards the two spines. The anterior of the two spines is situated at the termination of the anterior fourth of the tail. It is a little shorter than the posterior, which is situated a little more

backwards, and is about $\frac{1}{4}$ of the length of the tail. Behind the two spines the tail is naked and becomes very slender and tapering. Beneath it appears a very indistinct trace of a skinny hem. Single small individuals occur at Pinang at all seasons.

Breadth of the disk,	$5\frac{1}{8}$ inch.
From the snout to the anus,	$5\frac{2}{8}$
Length of the tail,	$7\frac{5}{8}$
From the snout to the mouth,	$1\frac{6}{8}$
„ to the eyes,	$1\frac{6}{8}$
Breadth of the mouth,	$0\frac{5}{8}$
Distance between the eyes,	$0\frac{7}{8}$
Length of the posterior spine,	2

Trygon zugei, Bürger.

Trygon zugei, Müller und Henle, 165. Taf.

Trygon zugei, Richardson : Report, 1845, 197.

(*Young.*) Above brownish yellow; caudal membranes black; beneath reddish white. Iris golden; pupil transversely oval.

Habit :—*Sea of Pinang.*

Indian Ocean, Sea of Japan, China.

The snout is very prominent, acute. The anterior margins of the disk are straight, the posterior convex. The external angle of the pectorals is equidistant from the apex of the snout and the anus. The length of the disk slightly exceeds the breadth. The distance between the nostrils and the apex of the snout is contained $3\frac{1}{2}$ times in that between the apex and the centre between the nostrils. The distance between the eyes is $\frac{1}{3}$ of their distance from the point of the snout. The teeth have a transversal keel. The thin tapering tail is double the length of the body. The spine is situated nearly at the anterior fourth of the tail. Behind the spine appear a superior and inferior membrane. Both are low, the inferior longer than the superior. The body is naked, but on the dorsal column, between the occiput and the scapular region, appear 3 distant small thorns. Some distant, very minute thorns appear on the sides of the tail behind the spine. The latter is about $\frac{1}{6}$ of the length of the tail.

From the apex of the snout to the mouth,	$1\frac{7}{8}$ inch.
„ mouth to the anus,	$2\frac{2}{8}$

Length of the tail,	9 inch.
Distance between the nostrils,	$0\frac{7}{16}$
Greatest breadth of the disk,	$4\frac{2}{8}$
Distance between the eyes,	$0\frac{5}{8}$
Breadth of the mouth,	$0\frac{7}{16}$

Single young individuals occur at Pinang, but rarely.

Gen. Pteroplatea, *Müller und Henle*, 1837.

The disk is nearly or more than twice as broad as long. Tail short, generally shorter than the body, naked or with low fins. Mouth slightly arched. The teeth do not extend to the angles of the mouth; they carry one to three points. The upper membranous valve of the jaw is indistinct, without fringes. No papillæ in the lower jaw. The skin is smooth, or covered with tubercles.

Pteroplatea micrura, (Bloch-Schn.)

Trygon micrura, Bloch-Schn. 300.

Russell, VI. Tenkee Kunsul. (*Young.*)

Raja poecilura, Shaw, V. 291.

Trygon kunsua, Cuvier, R. A. II. 400 (a)

Trygon poecilurus, Bennett: Life of Raffles, 694.

Pteroplatea annulata, Swainson, II. 319.

Pteroplatea micrura, Müller und Henle, 169.

Pteroplatea micrura, Richardson, Report, 1845, 197.

(*Very young.*) Above reddish- or bluish- brown, with numerous dark dots, or with distant indistinct light spots; beneath bluish- or reddish-white.

(*Older.*) Above bottle-green, or bluish-brown; tail with black and white or rose-coloured rings; beneath whitish. Iris golden, pupil transversely oval.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Bay of Bengal, Mouths of the Ganges, Red Sea, Sumatra, Java, Borneo, China Sea.

The snout is little prominent. The anterior margin of the pectorals is a little longer than the posterior and slightly concave in the middle; the posterior is convex; the external angle is conical, the posterior obtusely rounded. In younger individuals the length of the disk, from the snout

to the anus, is less than one half of the breadth of the disk, or the distance between the external angles of the pectorals. In older individuals the length is $\frac{3}{4}$ of the breadth of the disk. The distance between the inner angles of the nostrils is about one half of the greatest diameter of the nostril. The distance between the external angles of the nostrils is double the distance from their centre to the point of the snout, or their nearest distance from the pectoral margin. The teeth are tricuspidate; their central cusps are erect and longer than the lateral horizontal ones. In both jaws the teeth are confined to the central third, on each side of which in the upper jaw appears a notch corresponding to a minute prominence in the lower jaw. The depressed tongue occupies the whole breadth of the mouth. The margin of the spiracles carries no denticle. The body is naked. The ventral fins are elongated tetragonal, with the posterior angles rounded. The male appendages project beyond the inner margins of the ventrals, and extend to the root of the caudal spine. The length of the tail varies: in the very young it is shorter than the body, later it becomes a little longer than the body. It is depressed towards the spine, from thence it is cylindrical, very slender and tapering. It has no fins. The slender spine is situated at the anterior fifth. In the young, with the disk upwards of one foot in breadth, it is hidden in the integuments, and scarcely $\frac{1}{12}$ of the length of the tail. In a male, $15\frac{4}{8}$ inch in breadth, the spine is nearly $\frac{1}{13}$ of the length of the tail. The largest individual observed was taken in 1840 near the Island of Lantao, in the mouth of the Canton River; the disk measured 4 feet in breadth, 3 feet in length, and the tail 1 foot. The tail was armed with two spines situated close to each other; each about one inch in length. Single young individuals occur at all seasons in the Straits of Malacca.

Dimensions.

From the snout to the mouth,	$1\frac{5}{8}$ inch.
From the mouth to the anus,	$4\frac{3}{8}$
Length of the tail,	8
Distance between the inner angles of the nostrils,	$0\frac{3}{8}$
Greatest diameter of the nostrils,	$0\frac{6}{8}$
From the snout to the eyes,	$0\frac{7}{8}$
Distance between the eyes,	$1\frac{7}{8}$
Breadth of the disk,	$15\frac{4}{8}$

GEN. HYPOLOPHUS, *Müller und Henle*, 1837.

Form of the body like *Trygon*. Tail beneath with a fin, not extending to the apex. Upper fin absent. Differs principally from *Trygon* by the peculiar form of the mouth and the teeth. The centre of the lower jaw is pointed and projecting, and has on each side a forwards directed cavity. The margin of the upper jaw is excavated in the centre to receive the point of the lower jaw, and is very convex on each side. Teeth like paving stones, hexagonal, broader than long; in the upper jaw the teeth of the centre are small, those of the sides large; in the lower jaw they are nearly of equal size: the external ones smaller.

HYPOLOPHUS SEPHEN, (Forskål.)

Raja sephen, Forskål: Descr. 17, No. 16.
Raja sephen, Lacép. I. 123.
Raja sephen, Bl. Schn. 364.
Russell, III. Wolga Tenkee.
Raja sephen, Shaw, V. 288.
Raja sephen, Var. Shaw V. 289.
Trygon sephen, Cuv. R. A. II. 399.
Trigon sephen, Rüppell: Atlas, 52.
Trigon forskålii, ibid. 53, Taf. XIII. Fig. 2.
Trigon sephen, Rüppell: Neue Wirbelth. Fische, 69, Taf. XIX. Fig. 5, (Teeth.)
Hypolophus sephen, Müller und Henle, 170.
Hypolophus sephen, Bleeker: Verh. Bat. Gen. XXII. 6.

(*Young.*) Above reddish brown; the scaly portion of the head, back and tail lead-coloured; tail behind the spine, and caudal fin blackish brown; beneath whitish. Iris golden; pupil transversely oval, black.

HABIT.—*Sea of Pinang, Malayan Peninsula, Singapore.* Bay of Bengal, Mouths of the Ganges, Red Sea, Indian Ocean, Java, Madura.

The disk is rhombic, with rounded angles. In the very young the snout is more pointed than in the older. The external angles of the ventrals are acute, the internal obtuse. The distance between the nostrils is one half of their distance from the snout. The distance from the snout to the eyes exceeds by one third that between the eyes. The

snout is above covered with distant tricuspidate scales. On the upper part of the head, back and on the root of the tail they are smooth, hexagonal, with their anterior and posterior margins denticulated and with a shallow cavity in their centre. Three large heart-shaped convex plates, placed longitudinally, appear on the scapular region. Of the three the central one is the largest, the anterior the smallest. The tail is from three to four times the length of the body. As far as the spine it is depressed, trigonal and tapering; the portion supporting the caudal is compressed and with minute lanceolate scales; the rest is very attenuated like a whip cord. The spine is situated a little behind the anterior third of the tail; its length varies from $\frac{1}{5}$ to $\frac{1}{8}$ of the tail. The caudal membrane commences beneath the root of the spine and continues beyond the central third of the lower margin of the tail. Its height is less than that of the part of the tail to which it is attached. Single young individuals occur at all seasons in the Straits of Malacca.

Dimensions.

From the snout to the mouth,	$1\frac{5}{8}$ inch.
From the mouth to the anus,	$4\frac{3}{8}$
Length of the tail,	$26\frac{5}{8}$
Distance between the inner (anterior) angles of the nostrils,	$0\frac{3}{8}$
From the snout to the eyes,	2
Distance between the eyes,	$1\frac{3}{8}$
Breadth of the disk,	$7\frac{6}{8}$

Gen. Taeniura, *Müller und Henle*, 1837.

Disk rounded. Tail not much longer than the body, depressed in front of the spine, compressed behind it, with a high inferior fin, which commences from the spine and extends to the apex of the tail. The upper margin of the tail carries frequently a low longer or shorter skinny hem, extending to the apex of the tail. The caudal spine a little in front of the middle of the tail. Nostrils approximated as in *Trygon*. Teeth flattened, with a transversal protuberance, or pointed. Mouth straight or undulating. Membranous valve behind the upper jaw straight; that behind the lower jaw without papillæ.

Taeniura lymna, (Forskål.)

Raja lymna, Forskål: Descr. 17, No. 15.
Raja lymna, Linné: Syst. 1511.

Raja lymna, Lacép. I. Tab. IV. Fig. 2-3.
Raie torpille, ibid. Tab. VI. Fig. 1.
Raja lymna, Bl. Schn. 364.
Raja lymna, Shaw V. 287.
Trigon lymna, Rüppell: Atlas, 51, Taf. 13, Fig. 1.
Trygon lymna, Cuv. R. A. II. 400 (²).
Trigon lymna, Rüppell: Neue Wirbelth. Fische, 69, Taf. 19. Fig. 4. (Teeth.)

(Icon.) Trygon ornatum, Gray: Ill. Ind. Zool. I. Pl. 99.
Trygon lymna, Swainson, II. 319.
Taeniura halgani, Lesson in Duperrey: Voy. II. 100.
Taeniura lymna, Müller und Henle, 171, 197, Taf. (Mouth.)

(Young.) Above brownish bronze, with numerous oval and round ultramarine spots; from the scapular region on each side of the back a broad ultramine band, continuing on the sides of the tail to the root of the spine; caudal fin pale brownish, the lower margin edged with black; beneath greenish white. Iris narrow golden round the pupil, the rest dark blue; pupil transversely oval, black.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Indian Ocean, Red Sea, Timor, New Ireland.

Dimensions.

From the snout to the mouth,	$0\frac{6}{8}$ inch.
From the mouth to the anus,	$3\frac{2}{8}$
Length of the tail,	6
„ of the caudal spine,	1
Distance between the eyes,	$0\frac{4}{8}$
Breadth of the disk,	$4\frac{4}{8}$

This species is of rare occurrence in the Straits of Malacca.

FAM. MYLIOBATIDIDÆ.

Gen. Myliobatis (*Duméril*, 1817) *Müller und Henle*, 1841.

(Aëtobatis, *Blainville*, 1828.)

Snout pointed, composed by the united anterior pectoral rays. Nasal valves united, with straight margin. Mouth transversal. Both jaws with straight margin. Teeth hexagonal, in the centre a series of broader teeth, backwards, increasing in breadth. On each side smaller, tetragonal plates resembling paving stones, fitting into the zig-zags of the central

teeth. The teeth of the upper jaw longitudinally and transversely convex; those of the lower jaw flat, scarcely somewhat concave; teeth of neither jaw occupy the entire breadth.

Myliobatis nieuhofii, (Bloch-Schn.)

Aquilæ marinæ species, Willoughby, 6, Tab. X. Fig. 3 (App.)
Raja nieuhofii, Bl. Schn. 364.
Russell, VII. Mookarah Tenkee.
Raja fasciata, Shaw, V. 286, Pl. 143.
Myliobatis nieuhowii, Cuv. R. A. II. 401 (3).
Myliobatis aquila, Bonaparte: Fauna It. Fasc. II.
Myliobatis nieuhofii, Müller und Henle, 177.
Myliobatis nieuhofii, Richardson: Report, 1845, 198.
Pari klawar of the Malays.

(*Young.*) Above yellowish brown, with six or more narrow transversal bands of deep bluish purple; beneath whitish; tail blackish brown; posterior half with irregular white spots. Iris golden, pupil vertically elliptical. Teeth pale amber-coloured.

Habit.—*Sea of Pinang.*

Indian Ocean, Coromandel, Chinese and Australian Seas, Mediterranean.

In the very young the apex of the snout is double the length of the nasal valve. The pectorals are sickle-shaped. The dorsal is triangular, commencing at the root of the tail, and not extending beyond the apex of the ventrals. The length of the body is contained $2\frac{2}{3}$ times in the greatest breadth of the disk. The body is naked, and the tail without spine. The tail exceeds four times the length of the body. A female, observed at Pinang in May 1845, was of the following dimensions.

From the snout to the mouth,	$0\frac{5}{8}$ inch.
„ mouth to the anus,	$2\frac{5}{8}$
Length of the tail,	$14\frac{4}{8}$
From the root of the tail to the dorsal,	$0\frac{2}{8}$
From the snout to the eyes,	$0\frac{3}{8}$
Distance between the eyes,	$0\frac{6}{8}$
Breadth of the nasal valve,	$0\frac{4}{8}$
Length of do.	$0\frac{2}{8}$
Greatest breadth, (between the external angles of the pectorals,)	$8\frac{3}{8}$

MYLIOBATIS MILVUS, Valenciennes.

Myliobatis milvus, Müller und Henle, 178.

Pari klawar of the Malays.

(*Young.*) Above, pale fawn-coloured; on the head and back a number of distant anastomosing black lines, which on the anterior half of the root of the pectorals are arranged transversely, so as to make the ground-colour between them resemble very broad transverse bands; on the rest of the body, on the pectoral and ventral fins the black lines form an open net-work; the anterior margin of the pectorals, to near the apex, and the dorsal, pale fawn-coloured without black meshes. Anterior sixth of tail fawn-coloured, indistinctly ringed with blackish brown; rest of the tail black; abdomen white. Iris narrow golden round the pupil, the rest fawn-coloured; pupil heart-shaped, with the apex downwards. Teeth pale amber-coloured.

HABIT.—*Sea of Pinang.*

Red Sea.

The form of the body, teeth and fins is similar to that of *M. nieuhofii*, but the position of the dorsal fin differs. It commences farther behind the termination of the base of the ventrals, close to their apex, beyond which it does not extend. The male appendages are shorter than the corresponding margin of the ventrals; they are white, with a black longitudinal streak above. At its root the tail is greatly compressed, two edged, like the blade of an oar; the rest is slender like a whip-cord; its length is $4\frac{1}{2}$ times that of the body. The tail has neither spine nor fin. The body is naked. A single young male was observed at Pinang in August 1846. It was of the following dimensions:

From the snout to the mouth,	$1\frac{2}{8}$ inch.
,, mouth to the anus,	$6\frac{3}{8}$
Length of the tail,	$46\frac{2}{8}$
,, from the root of the tail to the dorsal,	$1\frac{1}{8}$
Base of the dorsal,	$0\frac{6}{8}$
Anterior margin of do.,	$0\frac{6}{8}$
Posterior margin of do.,	$0\frac{3}{8}$
Distance between the eyes,	$1\frac{5}{8}$
Distance between the nostrils,	$0\frac{7}{8}$
Breadth of the mouth,	$0\frac{6}{8}$
Anterior margin of the pectorals,	$9\frac{5}{8}$

Posterior margin of the pectorals,	$7\frac{3}{8}$ inch.
Base of the ventrals,	$0\frac{7}{8}$
External margin of do.,	$1\frac{7}{8}$
Internal do.,	$1\frac{1}{8}$
Male appendage,	$0\frac{7}{8}$
Greatest breadth of the disk (between the external angles of the pectorals,)	19

Gen. Stoasodon,* *Cantor.*

(*Equivalent to* Aëtobatis, *Müller und Henle*, 1841.)

Snout acute, undivided. The lower margin of the united nasal valves deeply indented. The frænulum of the nasal valve is covered with papillæ which are transversely disposed in front of the upper jaw. On the dorsal surface of the nasal valve, near the external margin, a lobule with fringed edge. Lower jaw acute, projecting beyond the upper; upper jaw with a straight margin. The dental laminæ of both jaws form a series, without smaller lateral teeth; in the lower jaw the laminæ are arched and parallel to the margin of the jaw. The laminæ do not occupy the whole breadth of the jaw.

Stoasodon narinari, (Bloch-Schneider.)

Narinari, Marcgrave, 176.
Ruysch: Thes. T. XXXIX. Fig. 6.
La raie aigle, Lacép. I. Pl. 6, Fig. 2.
Raja narinari, Bloch-Schn. 361.
Russell, VIII. Eel-tenkee.
Raja guttata, Shaw, V. 285, Pl. 142.
Raja quinqueaculeata, Quoy et Gaim. Freycin. 200, Pl. 43, Fig. 3.
Myliobatis narinari, Cuv. R. A. II. 401 (3)
Myliobatis narinari, Bennett: Life of Raffles, 694.
Myliobatis eel-tenkee, Rüppell: Neue Wirbelth. Fische, 70, Taf. 19, Fig. 3, (Teeth.)
Aëtobatis indica, Swainson, II. 321.

* Στοά, arcade; ὀδών, tooth. Substituted for *Aëtobatis*, Müller und Henle, 1841, preoccupied by *Aëtobatis*, Blainville, 1828, which as observed, is a synonyme of *Myliobatis*. The characters given are those of M. M. Müller and Henle.

Myliobatis narinari, Agassiz : III. Taf. D. 1, 2. (Teeth.)

Myliobatis macroptera, McClelland : Calc. Journ. Nat. Hist. I. 60, Fig. 1, a. b.

Aëtobatis narinari, Müller und Henle, 179.

Aëtobatis narinari, Bleeker : Verh. Batav. Gen. XXII. 6.

Pari lung of the Malays.

Above greenish olive or greenish grey ; a little behind the occiput and behind the anterior margin of the pectorals appear more or less numerous greenish-white rounded spots, edged with black ; tail behind the spine black ; abdominal surface of disk and tail as far as the spine greenish white ; rest black. Iris greenish golden ; pupil vertically elliptical. Teeth greenish white.

Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*

Indian Ocean, Red Sea, Bay of Bengal, Mouths of the Ganges, Sumatra, Java, Madura, Brazil, Surinam.

Greatest Breadth : 3 feet.

The snout is conical and about $\frac{1}{4}$ broader than long, and not quite double the length of the nasal valve. The nasal lobule is broad conical. The shape of the disk resembles that of *Myliobatis milvus*. The dorsal fin commences near the termination of the base of the ventrals, but terminates at some distance in front of the apex of the ventrals. The latter are elongated, about thrice as long as broad. The male appendages do not extend beyond the corresponding margin of the fin, and are shorter in the young. The tail is trigonal as far as the spine, the rest is compressed and flagelliform. Its length is thrice or four times that of the body. The spine is situated immediately behind the termination of the dorsal ; its length equals its distance from the anus. Some individuals are armed with a second somewhat longer spine, a little behind the root of the former. The dental laminæ of the upper jaw are very slightly arched ; the anterior margin of the external laminæ exhibits numerous vertical denticulations. The laminæ of the lower jaw are but $\frac{2}{3}$ of the breadth of those of the upper, but they are more convex, forming in the centre an obtuse angle. Single young individuals occur at all seasons in the Straits of Malacca. The following dimensions were taken from a young male, armed with two spines :

From the snout to the nostrils,	1 inch.
From the nostrils to the mouth,	$0\frac{4}{8}$

From the mouth to the anus,	$5\frac{6}{8}$ inch.
Length of the tail,	$33\frac{6}{8}$
Distance between the nostrils,	$0\frac{5}{8}$
„ „ the eyes,	$1\frac{1}{8}$
Breadth of the mouth,	$0\frac{5}{8}$
Distance from the snout to the eyes,	$1\frac{1}{8}$
Length of the anterior spine,	$1\frac{2}{8}$
„ of the second do.,	$1\frac{6}{8}$
Greatest breadth of the disk,	$11\frac{5}{8}$

Gen. Rhinoptera, (*Kuhl*) *Müller und Henle*, 1841.

The snout deeply divided by a central incision. The cranial fins are not on a level with the pectorals, but lower down, and are fixed at the inferior margin of the root of the pectorals. The rays of the cranial fins commence farther back than the termination of the pectorals. The lower margin of the nasal valve is straight; the external angle acute; on each side of their dorsal surface a longitudinal fold. The teeth stand side by side in 3 to 5 rows of broad hexagonal plates which laterally decrease in size. Outside appear several rows of smaller teeth, which are not broader than long. They occupy the entire breadth of the jaw.

Rhinoptera adspersa, Valenciennes.

Rhinoptera adspersa, Müller und Henle, 183.

Pari daun of the Malays.

(*Young.*) Above pale fawn-coloured; beneath white.

(*Older.*) Above chocolate brown or greenish olive; beneath white. Iris golden fawn-coloured; pupil vertically elliptical. Teeth yellowish white.

Habit.—*Sea of Pinang.*

Indian Ocean.

The teeth of both jaws are similar; those of the centre-row are hardly thrice as broad as long. The other rows gradually decrease towards the sides of the mouth. There are nine rows in the upper jaw, seven in the lower. The margin of the nasal valve is finely denticulated, its length is $3\frac{1}{2}$ times its height. The anterior margin of the pectorals is slightly convex; the posterior concave; the angles

acute. The ventrals are tetragonal, considerably projecting beyond the pectorals. The dorsal commences at the termination of the ventrals, and extends a little beyond their apex. The tail is about 3 to $3\frac{1}{2}$ times the length of the body; the anterior third is greatly compressed; the rest flagelliform. At a short distance from the dorsal is situated a small spine, but little longer than the base of the dorsal; a little behind it appears a second, scarcely longer than the preceding spine. In the young the back is smooth. In older individuals M. M. Müller und Henle describe the back as being rough from minute spines with stellate base. At Pinang this species occurs at irregular intervals, singly or a few together. The following dimensions were taken from a young female.

From the incision of the snout to the centre between the nostrils,	1 inch.
„ the nostrils to the mouth,	$0\frac{2}{8}$
„ the mouth to the anus,	$5\frac{1}{8}$
Length of the tail,	24
Breadth of the margin of the nasal valve,	$1\frac{4}{8}$
„ of the mouth,	$1\frac{1}{8}$
„ of the disk,	13
Length of the posterior margin of the pectorals,	$0\frac{7}{8}$
„ of external margin of the ventrals,	$1\frac{2}{8}$
„ of each caudal spine,	$0\frac{1}{8}$

FAM. DICEROBATIDIDÆ.

GEN. DICEROBATIS, (DIAROBATUS, *Bloch,*) *Blainville,* 1828.

(CEPHALOPTERUS,* [*Duméril,*] *Risso,* 1810.—CEPHALOPTERA, *Risso,* 1826.)

Mouth on the abdominal surface. Teeth of both jaws minute, flattened, like paving stones, of different forms. The rays of the pectorals extend closely to the skull. The anterior margin of the pectorals is convex from the skull behind the eyes to the apex.†

* Pre-occupied by *Cephalopterus*, Geoffroy, 1809, *(Aves.)*

† *Cephaloptera*, Müller und Henle, page 184.

Dicerobatis eregoodoo, (Cuvier.)

Russell: page 5, No. IX. Eregoodoo Tenkee. R. (Dorsal view.)
Cephaloptera eregoodo-tenkee, Cuv. R. A. II. 402 (').

(*Young ?*) Above intense purple, with blue and violet reflections; at the apex of the dorsal fin a whitish rounded spot; external margin of ventrals white; upper (external) surface of the cranial fins, and side of the head behind the eyes white; lower (internal) surface of the cranial fins silvery grey, of a chequered appearance, produced by the transverse divisions of the rays; the apex and internal margin broadly brimmed with black; beneath white; tail, as far as the ventrals extend, white, rest black; margin of the snout and both jaws black. Iris purple; pupil vertical, resembling the figure 8, or two vertically placed balls.

Habit.—*Sea of Pinang.*
Coromandel.

The inner half of the anterior margin of the pectorals is very slightly concave, the outer half convex; the posterior margin is concave; the external and internal angles acute. The length of the pectorals, from their origin, above and a little behind the eye, to their internal angle, is about $\frac{2}{5}$ of the greatest breadth of the disk. The ventrals project but little beyond the pectorals. The male appendages are about $\frac{2}{3}$ of the internal margin of the ventrals, slender and throughout attached to the margin. The tail slightly exceeds $1\frac{1}{2}$ times the length of the body; it is very slender, flagelliform, and nearly throughout tetragonal. The dorsal fin has the appearance of being triangular, but it has a posterior very short margin. It commences a little in front of the ventrals and terminates a little behind their termination. The apex of the dorsal hardly extends beyond the anterior half of the ventrals. The body is smooth to the touch. The upper surface of the head and the throat are perforated by numerous pores. At the posterior part of the back appear some very minute scales or spines, which resemble white dots. They are distant and offer no resistance to the touch. The tail is naked and without spine. The anterior margin of the head (the snout), between the cranial fins, is concave. The distance from the centre of this margin to the mouth is $\frac{1}{3}$ of the breadth of the mouth. The length of the cranial fins, from their origin a little behind the mouth to their apex, equals the distance between both fins

across the throat. Both are parallel, not diverging, as they appear in M. M, Müller and Henle's figure of *Cephaloptera kuhlii*. They are turned upwards, their upper surface being longitudinally hollowed. The spiracles are very small, hid beneath the origin of the pectorals. The margin of the nasal valve is straight and covers nearly the whole of the upper jaw. The angles form a conical lobule. The narrow band of teeth extends in both jaws not quite to the angle, occupying the central $\frac{5}{7}$ of the breadth of the mouth. The teeth are uniformly minute, flattened, of a pentagonal shape, with backwards directed point. They have frequently two or three such points. They are generally twice broader than long, but in both jaws appear here and there a single tooth broader than the rest, as if composed of two or three teeth soldered together. The upper jaw has 80, the lower 95 rows of teeth, each consisting of 6, rarely 7. Behind the upper jaw appears a large membranous valve, the free margin of which is convex. There is no trace of a tongue. The equidistant gill-openings are arranged on two backwards converging lines. Each opening is of this figure ∽, the first being double the length of the fifth. The only individual examined, was observed at Pinang in February 1845. It was a male, apparently young, of the following dimensions.

From the centre between the cranial fins to the centre of the snout,	$3\frac{2}{8}$ inch.
From the centre of the snout to the mouth,	$1\frac{2}{8}$
„ the mouth to the anus,	11
Length of the tail,	$19\frac{2}{8}$
Distance between the nostrils,	$2\frac{7}{8}$
„ from the nostrils to the mouth,	$0\frac{5}{8}$
Breadth of the mouth,	$3\frac{5}{8}$
Length of the cranial fins,	$5\frac{2}{8}$
Distance between them,	$5\frac{2}{8}$
„ between the eyes,	5
Base (Length) of the pectorals,	$13\frac{2}{8}$
Breadth of do.,	$13\frac{4}{8}$
Base of the dorsal,	$1\frac{6}{8}$
Anterior margin of do.,	$2\frac{1}{8}$
Posterior „ of do.,	$0\frac{3}{8}$
Superior „ of do.,	$0\frac{7}{8}$

Length of the ventrals,..... $2\frac{2}{8}$ inch.
„ „ „ first gill-opening, ... $1\frac{4}{8}$
„ „ „ fifth do., ... $0\frac{7}{8}$
Distance between the first gill-openings, ... $3\frac{3}{8}$
Greatest breadth of the disk,..... $30\frac{5}{8}$

The stomach is elongated cylindrical, half the length of the body; the intestines equal the length of the body.

This fish agrees in several characters with Russell's *Eregoodoo Tenkee*, No. IX. R, (*not* No. IX. N, from St. Helena.) M. M. Müller and Henle express some doubt as to the identity of Russell's No. IX and *Cephaloptera olfersii*, Müller, (*Plagiostomen*, page 185) from Brazil. According to the description of M. M. Müller and Henle, the latter differs from the present species in the following characters. In *C. olfersii* the distance of the mouth from the head is in proportion to the breadth of the mouth as 3 to 13; in the present species that distance is $\frac{1}{3}$ of the breadth of the mouth, or as 1 to 3. In *C. olfersii* the length of the cranial fins compared with their distance is as 8 to 11; in the present species both are equal. In *C. olfersii* the length of the pectorals, measured from their origin on the skull, equals half the breadth of the disk; in the present species their length is less than the breadth of the disk.

ADDENDA.

The following alterations are made by referring to *Histoire Naturelle des Poissons, Tome* XXII. and to *Neue Wirbelthiere. Fische.*

Page 1253.

Saurus trachinus, Temminck et Schlegel, is the young of:

SAURUS MYOPS, (Forster.)

Lagarto, Parra, XVIII. Fig 2?

Salmo fœtens,* Bloch, Tab. 384, Fig. 2.

Osmère galloné, Lacép. V. Pl. 6, Fig. 1.

Salmo myops, Forster, Bl. Schn. 421.

Salmo truncatus, Spix et Agassiz: Esp. et Gen. XLV.

Saurus myops,
Saurus truncatus, } Cuvier: R. A. II. 314 (1).

Saurus lemniscatus, (S. elegans, Gray,) Richardson, Report, 1845, 301.

Saurus trachinus, Temm. et Schl. Fauna Japon. Pisces, 231, Tab. CVI. Fig. 2. (*Young.*)

Salmo myops, Forster: Descr. Anim. ed. Lichtenstein, 412, No. 303.

Saurus fasciolatus, Lesueur, Cuv. and Val. XXII. 489.

Saurus myops, Cuv. and Val. XXII. 485.

HABIT.—*Sea of Pinang.*

Indian Ocean, Trincomallee, Pondicherry, Celebes, Amboyna, Sea of China, Macao, Japan, Atlantic Ocean, St. Helena, Isle of France, Martinique, South Carolina, Bahia, Brazil. (Cuv. and Val. l. c.)

Page 1256.

To the Synonymes of *Saurus nehereus,* (Buchan. Hamilton,) add: *Saurus ophiodon,* Cuv. and Val. XXII. 490.

* Not *Salmo fœtens,* Linné (Cuv. et Val. XXII. 488.)

Page 1252.

Saurus badi, Cuvier, belongs according to M. Valenciennes to a distinct genus, following that of *Saurus*, and M. Valenciennes has corrected the nomenclature as follows.

Saurida, *Cuvier and Valenciennes*, 1849.

The palatals have on the inner side of the long band of teeth a small distinct group of sharp teeth, surrounded by minute asperities. The palatals consequently have two separate series of teeth, whereas in the genus *Saurus* they have but a single such. The internal ventral rays are not so elongated as those of *Saurus;* two oblong fossets on the sides of the palatals, but none in front of the velum palatinum, like those of *Saurus*.

Saurida tumbil, (Bloch.)

Salmo tumbil, Bloch, Tab. 430.
Russell: CLXXII. Badi Mottah.
Salmo tumbil, Shaw, V. 67.
Saurus badi, Cuv. R. A. 314 (').
Saurus badimottah, Rüppell: Neue Wirbelth. Fische, 77.
Saurus argyrophanes, Richardson, Report 1845, 302.
Saurida tombil, Cuv. and Val. XXII. 500.
Habit.—*Sea of Pinang, Malayan Peninsula, Singapore.*
Malabar, Coromandel, Vanikolo, Waigiou, Macao, Red Sea, Isle of France (Cuv. and Val. l. c.)

Page 1381.

To the Synonymes of *Carcharias acutus* add: Rüppell: Neue Wirbelth. Fische. 65, Taf. 18, Fig. 4.

Page 1382.

To the Synonymes of *Carcharias melanopterus* add: Rüppell: Neue Wirbelth. Fische. 63.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. Crenidens sarissophorus. Natural size.
2. Tooth of the anterior series, upper jaw. Magnified.
3. Ditto of the posterior series, Ditto. Ditto.
4. Vertical section. Natural size.

Plate II.

Fig. 1—3. Macropodus pugnax. Natural size.
2. Labyrinth. Natural size.
3. Vertical section. Natural size.
4. Macropodus pugnax, Var. Magnified.
5. Trichopodus trichopterus. Labyrinth and branchiostegous rays. Natural size.

Plate III.

Chætodon prætextatus. Natural size.

Plate IV.

Fig. 1. Acanthurus xanthopterus. Natural size.
2. Vertical section. Natural size.
3. Tooth. } Magnified.
4. Scale. }

Plate V.

Fig. 1. Ophiurus baccidens. Dentition. Natural size.
2. Ophiurus boro. Dentition. Natural size.
3. Ophiurus grandoculis. Dentition. Magnified.
4. Ophiurus breviceps. Dentition. Magnified.
5. Muræna thyrsoidea. Dentition. Natural size.
6—7. Monopterus javanicus. Head. Natural size.
8. Monopterus javanicus. Dentition. Natural size.

Plate VI.

Fig. 1. Dalophis anceps. Natural size.
2. Vertical section. Natural size.
3. Dentition. Magnified.
4. Head. Magnified.

Plate VII.

Fig. 1. Symbranchus caligans. Natural size.
2. Head. Magnified.
3. Dentition and Tongue. Magnified.

Plate. VIII.

Fig. 1. Alutarius barbatus. Natural size.
2. Ostracium tesserula. Natural size.
3. Ostracium tesserula. Vertical section. Natural size.

Plate IX.

Fig. 1. Triacanthus strigilifer. Natural size.
2. Scale of Triacanthus strigilifer. Magnified.
3. Scale of Triacanthus biaculeatus. Magnified.

Plate X.

Tetrodon naritus. (*Young.*) Natural size.

Plate XI.

Fig. 1. Hippocampus mannulus. Natural size.
2. Hippocampus comes. Natural size.

Plate XII.

Fig. 1. Temera hardwickii. *(Young male.)* Natural size.
a. a. The electric organs. *b.* Cartilaginous fascicles. *c.* Cutaneous nerve. *d.* Abdominal cavity.

Fig. 2. Temera hardwickii. (*Young male*, 1 *foot in length.*) Brains, medulla oblongata and anterior part of spinal cord, viewed from above.
a. Left spiracle. *b. c.* Two branches of Trigeminus, supplying the anterior part of the left electric organ. *d. e.* Two branches of Pneumogastricus, supplying the posterior part of the left electric organ.

Fig. 3. Cysteocercus temeræ. Magnified ($\frac{1}{20}$ single lens.)

Plate XIII.

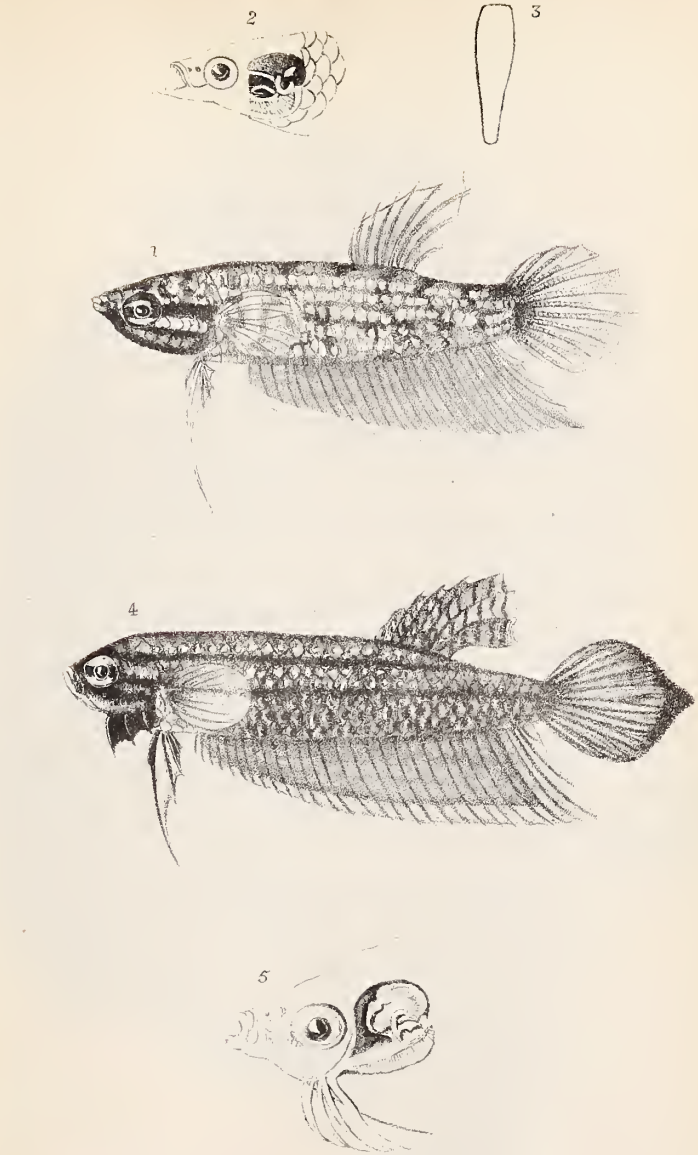
Fig. 1. Corythobatus echinatus. Natural size.
2. Dentition. Magnified.
3. Vertical section. Natural size.

Plate XIV.

Rhinobatus ligonifer. (Young male.) Natural size.



CRENIDENS SARISSOPHORUS



Dr Cantor del.

Fig. 1-3 MACROPODUS PUGNAX. 4 VAR. 5 TRICHOPODUS TRICHOPTERUS.



T. Cantor, del.

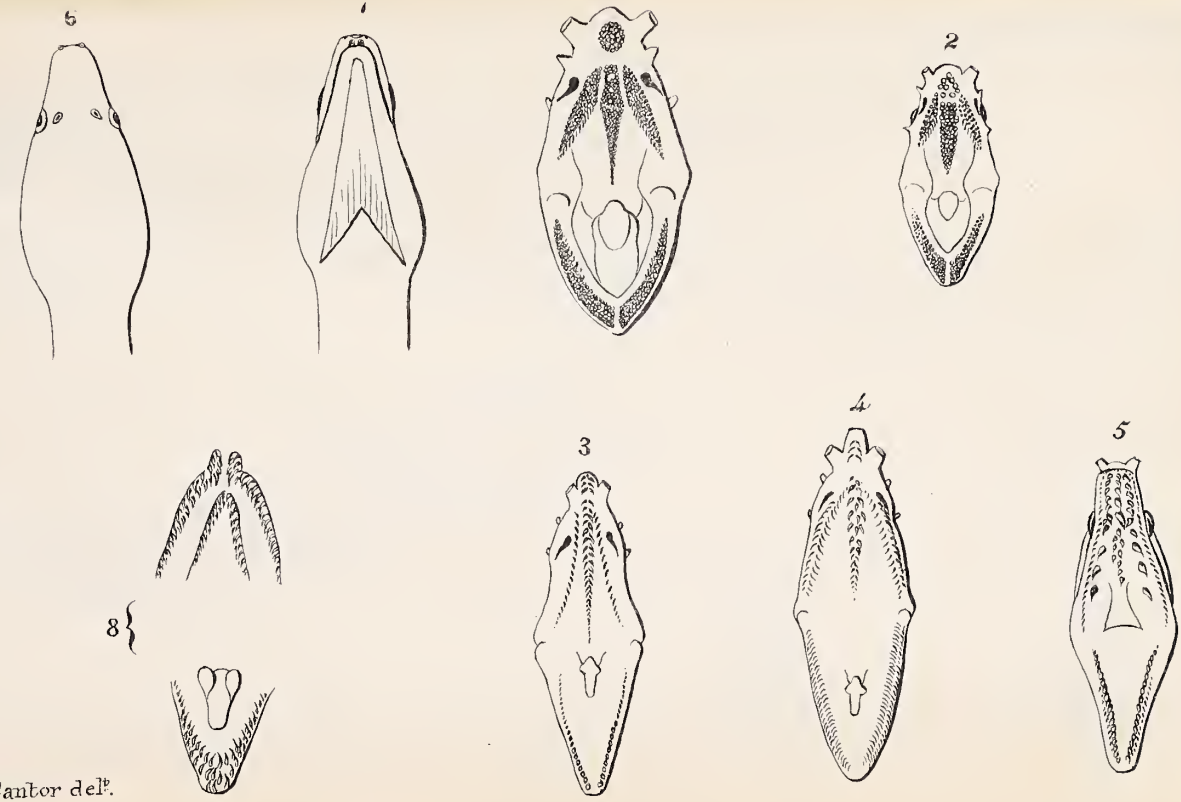
T. Black. Asiatic Lith: Press Calcutta

CHÆTODON PRÆTEXTATUS



T Cantor del

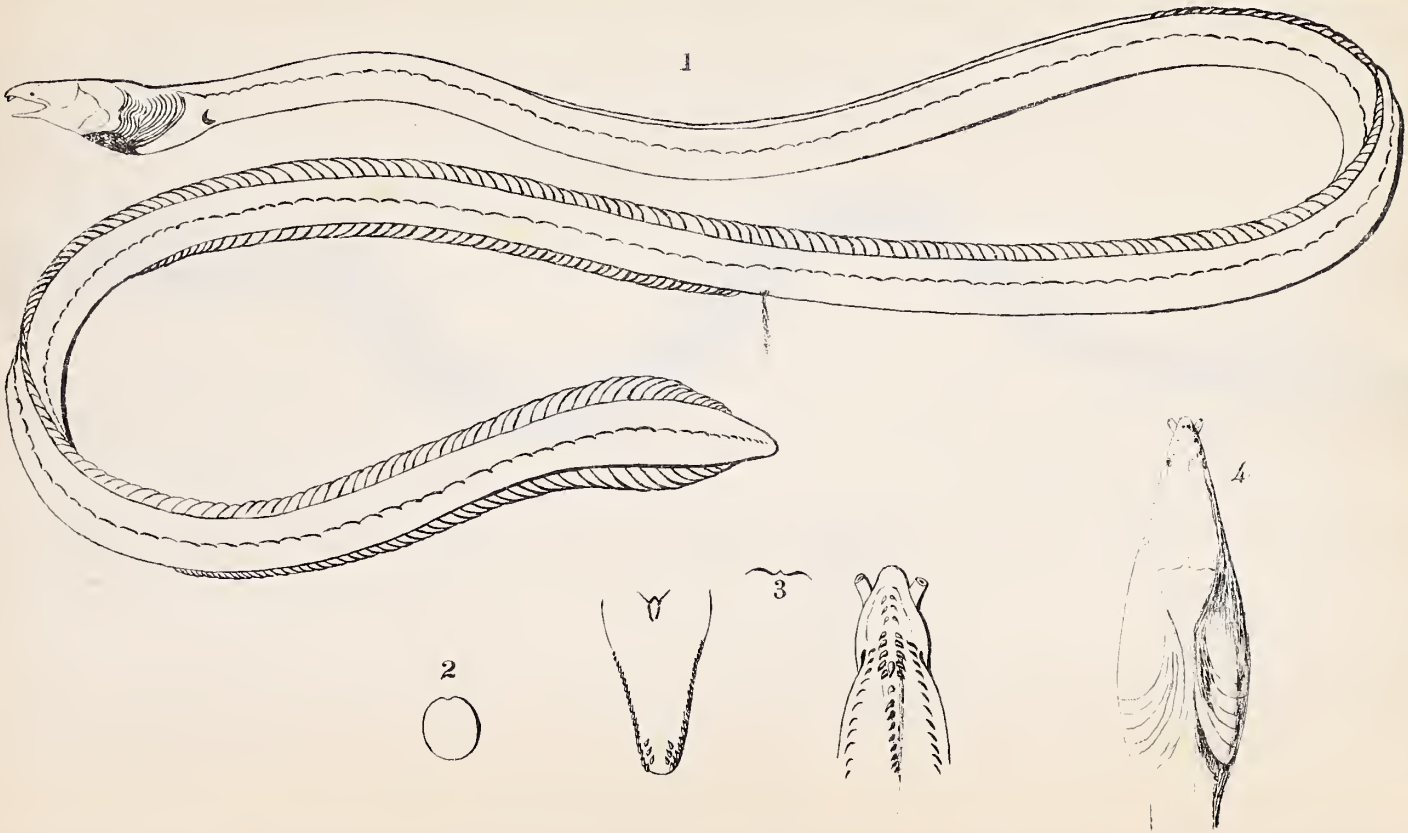
ACANTHURUS XANTHOPTERUS



T. Cantor del.

1. OPHIURUS BACCIDENS. 2. O. BORO. 3. O. GRANDOCULIS. 4. O. BREVICEPS.

5. MURÆNA TUVR SOIDEA. 6-8. MONOPTERUS. JAVANICUS

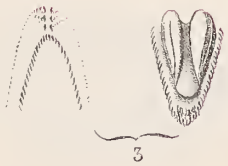


T Cantor del.

DALOPHIS ANCEPS



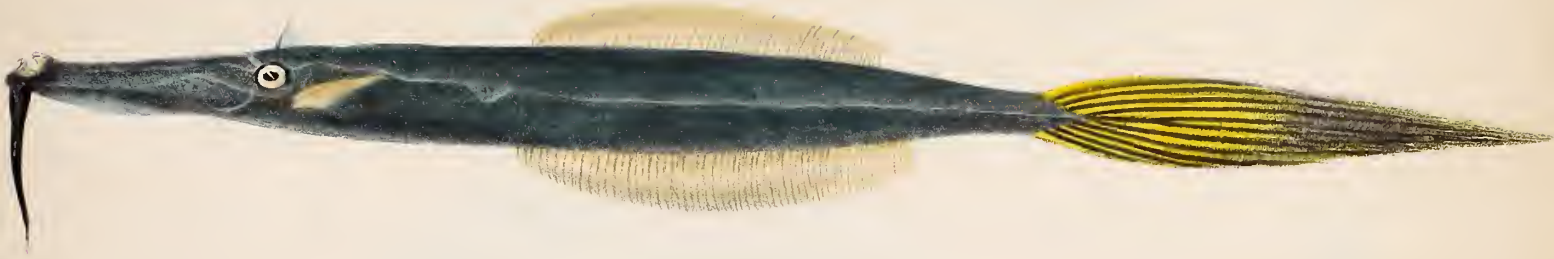




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SYMBRANCHUS CALIGANS.

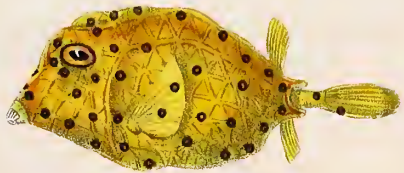
1



3



2



Dr Cantor del.

Fig. 1. ALUTARIUS BARBATUS. 2–3 OSTRACIUM TESSERULA.

TRIACANTHUS BIROSTRIS



T. Canbor, del.

T. Black-Asiatic Lith-Press. Calcutta

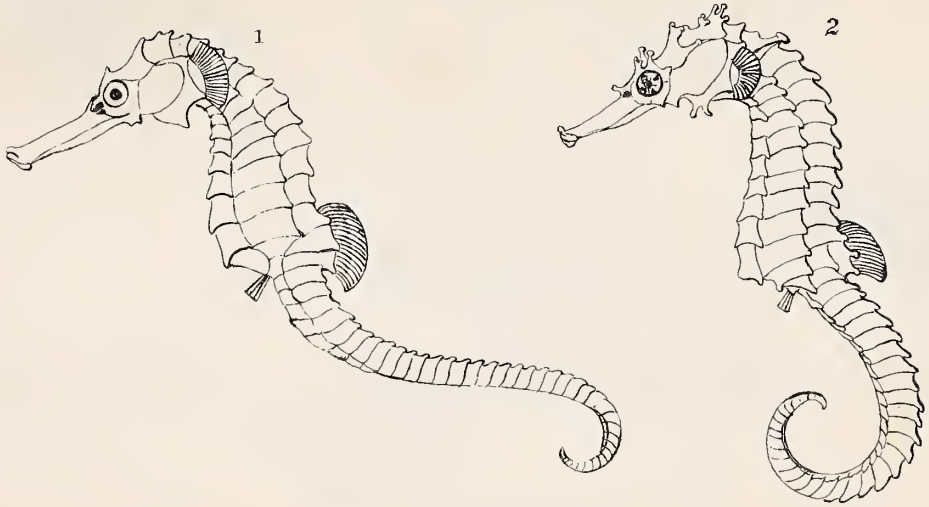
TRIACANTHUS STRIGILIFER



T. Cantor, delt.

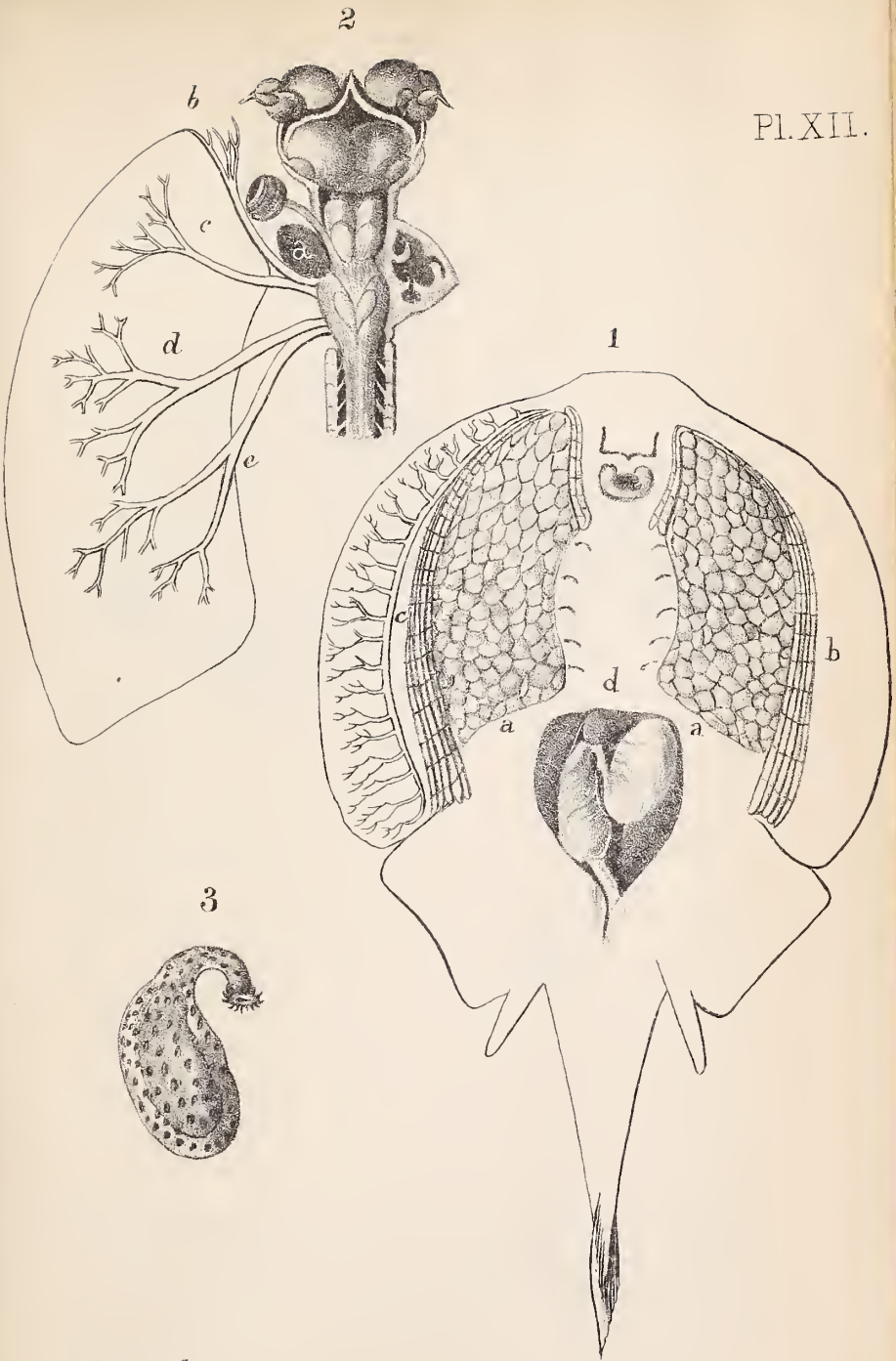
TETRODON NARITUS
(JUN.)

T. Black, Asiatic Lith. Press, Calcutta.



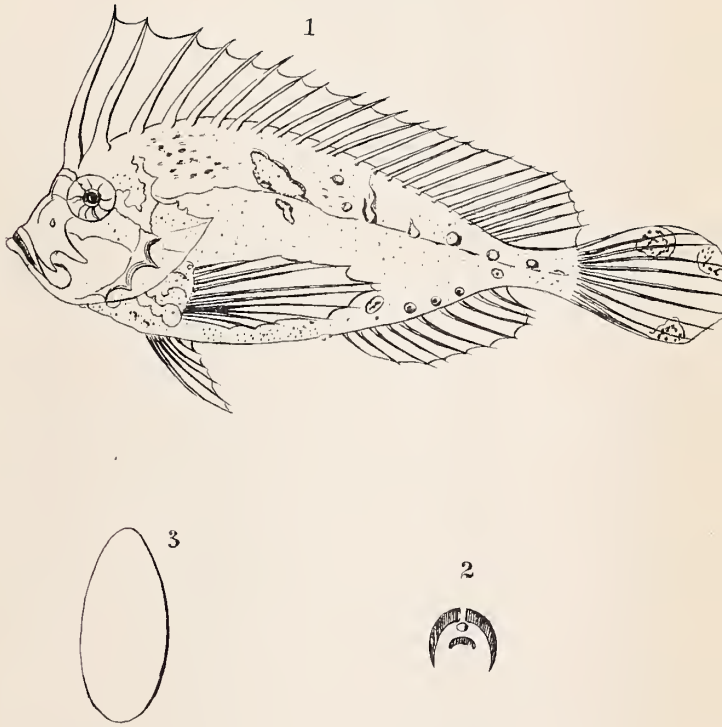
T. Cantor del.

1. HIPPOCAMPUS MANNULUS. 2. H. COMES.



Dr Cantor del.

Fig. 1-2. TEMERA HARDWICKII.
Fig. 3. CYSTEOCERCUS TEMERÆ.



T. Cantor del.

CORYTHOBATUS ECHINATUS

PLX V



anterior

PR. ACEBIUS DEL. ET LITH.

INDEX.

The names of SUBCLASSES, ORDERS, FAMILIES and GENERA are printed in CAPITALS; those of Species and miscellaneous contents in Roman Characters. All *Synonymes* are printed in *Italics*.

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* The Malayan name for Fish. It is here prefixed to the vernacular names current in Prince of Wales Island (Pulo Pinang).

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Page 1019, *line* 23, *for* Colliomorus, *read :* Calliomorus.
„ 1102, *line* 16, *for* Traghynotus, *read :* Trachynotus.
„ 1122, second line from the bottom, *for* ventral, *read :* neutral.
„ 1158, *line* 27, *suppress :* Hommel.
„ 1206, eighth line from the bottom, *for Malayan, Peninsula, read : Malayan Peninsula.*
„ 1209, *line* 25, after Ed. *add :* I.
„ 1286, *line* 7, *for* XXII. *read :* XXI.
„ 1377, *line* 19, *for* Fig 1, *read :* Fig. 2.

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